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Mosquito News

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Published Quarterly

by the

AMERICAN MOSQUITO CONTROL ASSOCIATION, INC.

VOLUME 14

JUNE, 1954

NUMBER 2

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MOSQUITO NEWS

Official Publication of the American Mosquito Control Association, Inc.

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Published by

AMERICAN MOSQUITO CONTROL ASSOCIATION, INC.

Printed by

Boyd Printing Company, Inc., Albany, N. Y.

A quarterly journal published on the 20th of March, June, September and December. Devoted to the improvement and the sound extension of mosquito control and related work as a vital public health service.

SUBSCRIPTION RATES

\$5.00 per Year (U. S. money), Single Copies, \$1.75

Mailed without charge to members of the Association.

MEMBERSHIP DUES—\$5.00

BUSINESS COMMUNICATIONS

Communications relating to editorial matters and manuscripts submitted for publication in *Mosquito News* should be addressed to Donald L. Collins, Editor, *Mosquito News*, New York State Museum, Albany, New York.

Communications relating to advertising space should be addressed to W. E. BICKLEY, Advertising Manager, *Mosquito News*, Univ. of Maryland, College Park, Md.

Communications relating to subscriptions to *Mosquito News*, Membership in the American Mosquito Control Association, and other association matters should be addressed to T. G. Raley, Executive Secretary, American Mosquito Control Association, 1941 Front St. W., Selma, Calif. Changes of address should reach the Secretary before the first of the month of publication.

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ARTICLES

DESCRIPTION OF A TRAP FOR *MANSONIA* LARVAE

WILLIAM L. BIDLINGMAYER

The biology of *Mansonia* mosquitoes has always been difficult to study. An important factor has been the difficulty of obtaining larvae, since they remain attached to the roots of aquatic plants during their development. McNeel (1931) secured the larvae of *Mansonia perturbans* (Walker) by pulling or digging up the host plant and washing the roots in a bucket with a screened bottom. The muck thus collected was examined in small quantities for the larvae. This method could not yield any quantitative data.

It was observed that the larvae of *Mansonia perturbans* (Walker), when kept in a container without plants, would rise to the surface of the water and obtain air as do mosquito larvae of other genera. (This observation had been previously made by Shute (1930).) Utilizing this habit, a trap was designed whereby the larvae, once dislodged from their host plant, would rise to the surface for air, and would be caught and held in a collecting basin at the surface.

The trap consists of two parts. The first is an outer cylinder of twenty-two gauge galvanized sheet metal, thirty inches high and thirteen and seven-eighths inches in diameter. The area of its base is one square foot. The second part is an inner insert that collects and holds the larvae. Two kinds of inserts have been devised, but both operate on the same principle. Figure 1 shows the outer cylinder with a portion of it cut away to show one of the inserts, in this illustration, the pyramid type. This type consists of a cylinder slightly less than $13\frac{3}{8}$ inches in diameter and 10 inches high. Its floor is composed of a number of pyramids with a base of $3\frac{1}{2}$ inches and $2\frac{1}{4}$ inches in height. See also figure 2.

The simpler type of insert is shown in

figure 3. It operates on the same principle as the pyramid type. It consists of a twenty-six gauge galvanized sheet metal cone, slightly less than thirteen and seven-eighths inches in diameter, twelve inches high, and with a one and three-quarters inch opening at the top. The cone is sur-

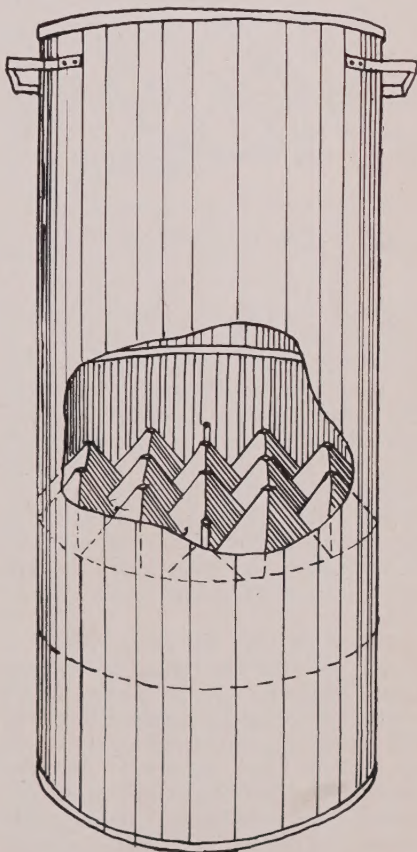


FIG. 1. Cutaway perspective view of *Mansonia* trap, showing pyramid type of insert.

is little danger of losing *Mansonia* larvae, as they will be at the bottom of the cylinder.

The trap is usually set for a period of twenty-four hours, although this is far longer than necessary, particularly when *Mansonia indubitans* larvae are being collected. The water within the collecting basin is removed with a rubber syringe and spread in a large white enamel tray. The larvae may then be removed with a pipette. If the trap is carefully set, there should be very little sediment in the water, although, as mentioned before, the cone type usually contains more sediment than the other type.

The two types of inserts were compared in a borrow pit which had a clean sand bottom and was completely free of any vegetation. A known number of 4th instar larvae of *Mansonia perturbans* were placed within the cylinders and the trap set. After 24 hours, the cone type recovered an average of 83 percent and the pyramid type 71 per cent of the larvae.

In the author's opinion, the pyramid type of insert is to be preferred over the cone type. Although it is more difficult to construct and somewhat less efficient, it is possible to set the pyramid type in as little as four inches of water and it usually contains less sediment. This reduces the time required to examine it. The cone type, however, is entirely satisfactory otherwise.

FACTORS AFFECTING *Mansonia* COLLECTIONS. The proportion of occurring larvae which the trap will catch at one setting will depend to some extent on the care with which it is set and collected from, but more especially it will depend on environmental conditions. There is every indication that all four larval instars are collected in the proportions actually occurring. Pupae are rarely recovered in these traps, for as shown by Dorer *et al.* (1950), they are attached so tenaciously as to be seldom washed free.

Another factor affecting the efficiency of the traps is the number of roots still remaining at the bottom of the cylinder after the trap is set. In areas where only

a few inches of sediment overlies a sand substrate, it is not difficult to remove virtually all roots. But in areas where the substrate consists of several feet of peat, removal of the host plant often results in removing a core of roots and peat so that the bottom is beyond arm's reach. In other cases, the substrate is interlaced with such a vast number of roots that many exposed broken ends must be available to the larvae for reattachment. Nevertheless, when traps were reset for two or three days in succession in a peaty area, and the water inside the cylinder agitated to dislodge any reattached larvae, very few additional larvae were recovered. For instance, over one period of three days of successive settings, 681 larvae were collected the first day, 56 the second day, and only one the third day. This means that 92.3 per cent of the total were caught the first day, 7.6 per cent the second day, and only one-tenth of one per cent on the third day.

The amount of plant roots and litter that must be removed is another factor affecting the trap's operation. The volume of material to be washed and discarded is so great that often the water level within the cylinder is lowered by two to eight inches. It is almost certain that some larvae must become entangled and lost.

Mansonia larvae exhibit a light avoidance reaction which prolongs the time before they will attempt to rise to the surface. The larvae also become increasingly sluggish with lowered temperatures, and are inert at temperatures close to the freezing point. Thus, the trap becomes less effective with decreasing water temperatures.

ACKNOWLEDGMENTS. The writer wishes to express his appreciation to Dr. M. W. Provost of the Bureau of Entomology, Florida State Board of Health, for his suggestions and help while reviewing this paper.

SUMMARY. A trap for the recovery of *Mansonia* larvae is described which is intended to yield quantitative data. The trap is based on the principle that *Mansonia* larvae will rise to the surface of the

water to obtain air if there are no aquatic plants available. Several environmental factors which affect the operation of the trap were discussed.

References

- DORER, R. E., R. G. CARTER and W. E. BICKLEY. 1950. Observations on the pupae of *Mansonia perturbans* (Walk.) in Virginia. Proc. Ann. Meet. N. J. Mosq. Extermin. Assoc. 37:110-113.
- McNEEL, T. E. 1931. A method for locating the larvae of the mosquito *Mansonia*. Science, Vol. 74, No. 1910, p. 155.
- SHUTE, P. G. 1930. A contribution to the biology of *Taeniorhynchus richardii* (Diptera). The Entomologist, London, 63:133-136.

A PORTABLE PNEUMATIC SPRAY UNIT¹

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In recent years a number of appliances have been developed for producing insecticidal fogs or mists for the control of adult biting flies. Some of these are highly efficient, but almost all of them depend upon a vehicle of some sort, either as a source of power or as a means of transport. There remained a need for a unit that would produce a useful volume of insecticidal mist, but would be sufficiently light and portable to be operated independently of existing roads or trails.

The subject of this paper is a unit developed from one produced at the Orlando, Fla., laboratory of the Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture (Husman, 1953), which was originally intended to be operated from the engine of a jeep or similar vehicle. A later modification, powered by a small air-cooled engine, was mounted on a small hand-cart. The sprayer developed at Kamloops (Figs. 1-5) utilizes an extremely light gasoline motor coupled to an air compressor slightly smaller than that in the prototype, and is mounted on a pack-frame. The total weight, including engine, compressor, two-gallon tank, spray boom, and all connec-

tions, but without insecticide, is 40 lb. and the unit can be carried with ease wherever a man can go.

The pack-frame is made of 3/8-inch steel tubing (electrical conduit) with welded joints. The design and dimensions are given in Fig. 1. The frame is supported on the back by a strip of canvas 24 x 26 inches, laced to the frame with a cord that passes through six brass grommets in each of the opposite ends of the canvas. The load is carried to the shoulders by a wide canvas band 54 inches long, each end of which terminates in a leather strap. The straps engage in buckles bolted to the lower ends of the outer bars of the frame, and the band passes from one buckle, through an 8-inch slit in the canvas 2 1/2 inches below the upper margin, is wrapped twice around the upper cross-bar, and returns through the slit and down to the other buckle. The leather straps permit adjustment of length to suit the operator.

The engine is one of a series produced by Power Products Corp. of Grafton, Wis. It develops 1.2 h.p. at 3300 r.p.m., and weighs 16 1/2 lb. complete. Some minor changes were necessitated by the attachment of the engine to a vertical base. The original rectangular fuel tank was removed, and a new one of somewhat streamlined form, made of aluminum

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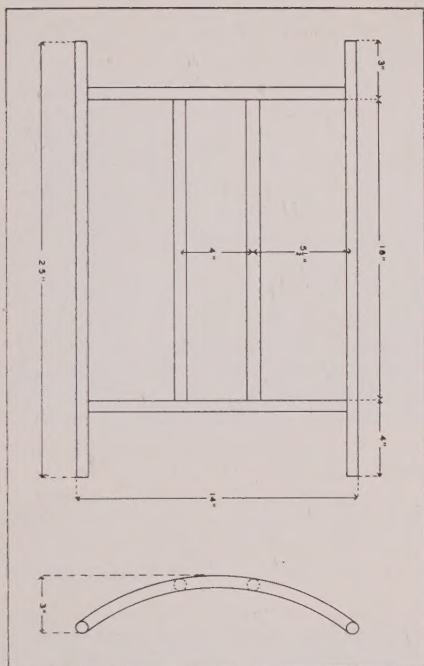


FIG. 1. Plan and elevation of steel pack-frame; material, $\frac{3}{8}$ -inch steel conduit.

sheet, was attached above the engine. The carburetor was rotated 90° at its point of attachment.

The compressor is an oilless vane-type machine, with a rated output of 5.6 c.f.m. at 10 p.s.i., and weighing $8\frac{1}{2}$ lb. To harmonize the direction of rotation of engine and compressor, a hole was bored in the blind end of the compressor shaft and a threaded extension was screwed into it to accommodate the flexible coupling. Since this was done, it has been learned from the manufacturers (Gast Mfg. Corp., Benton Harbor, Mich.) that a few compressors are available with a clockwise rotation. The governor of the engine was set down to 2000 r.p.m. to avoid overloading the compressor.

The insecticide tank is formed from 5-inch aluminum tubing, as used in portable irrigation systems. It is mitred to form a U having a base of 10 inches and

arms of 9 inches on the center line, giving outside dimensions of $15 \times 11\frac{1}{2}$ inches. Inside clearance between the arms is 5 inches. This tank has a capacity of 2 imperial (2.4 U. S.) gal. In future models, it is proposed to use 6-inch tubing with side arms of $11\frac{1}{2}$ inches on the center line. This will hold 3.4 imp. gal. A small tube connecting the tops of the two arms of the U equalizes pressure between them. The top of the right-hand arm has a filler-cap and two $\frac{1}{8}$ -inch hose connections welded in. One of these is the air inlet, and the other leads to a $\frac{1}{8}$ -inch copper tube which extends to within $\frac{1}{4}$ -inch of the bottom of the tank and forms the insecticide outlet.

From the outlet connection of the compressor, a $\frac{1}{4}$ -inch nipple leads to a tee that divides the air stream. One branch leads to another tee to which are connected the air-line pressure gauge and the air-line to

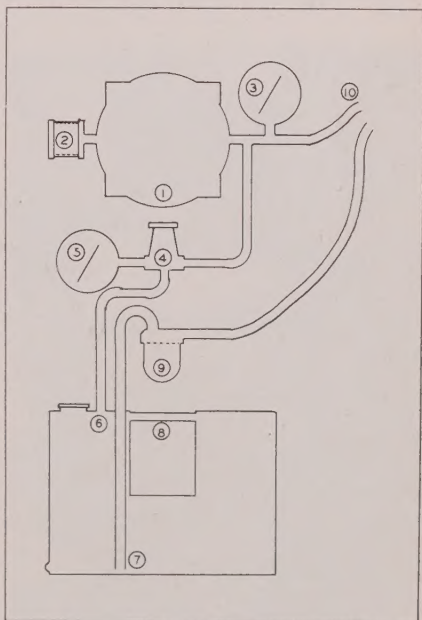


FIG. 2. Flow diagram of pneumatic sprayer. 1, Compressor; 2, air inlet filter; 3, boom air-gauge; 4, by-pass regulator; 5, tank air-gauge; 6, air inlet to tank; 7, insecticide outlet; 8, tank equalizing tube; 9, strainer; 10, air to boom.

the nozzles. The other is connected to a by-pass regulating valve and gauge, and thence by a flexible tube to the insecticide tank. The outlet from the tank leads to a strainer-bowl and thence to the liquid side of the nozzle boom.

The nozzle head is formed of two loops of copper tubing, one each for liquid and air. Short nipples of $\frac{1}{8}$ -inch copper tube are brazed in at suitable intervals, and are connected to the nozzles by brass fittings. The boom is made of two $\frac{1}{4}$ -inch pipes welded together for part of their length but widely spread at their outer ends, where they are brazed, each to its proper loop. The air line is 19 inches long, and terminates at its inner end in a brass hose coupling. The liquid line is 22 inches long and its inner end is offset to allow space for manipulation of hose couplings and the shut-off valve. The straight portion of the boom is enclosed in a wooden handle that stiffens the assembly and pro-

vides a convenient grip. Two $3\frac{1}{2}$ -foot lengths of oil-resistant hose connect the boom to the machine.

The coarse nozzle head is a cluster of three pneumatic nozzles connected to the boom by $\frac{1}{4}$ -inch copper tubing and $\frac{1}{4}$ -by $\frac{1}{8}$ -inch brass fittings. The nozzles used are the combination No. 60100-140-6-5270 made by Spraying Systems Co., 3242 Randolph St., Bellwood, Ill. A finer mist can be obtained by using a separate head with a cluster of six No. 40010-120-6-35-60 nozzles. The change from a six- to a three-nozzle assembly may be made by plugging the unused outlets, but it is more convenient to have a separate three-nozzle boom which can be attached or detached by the manipulation of the two hose couplings at the base.

In operation, the by-pass regulator is set to give a pressure of 10 p.s.i. in the tank. The air-line pressure is about 13 p.s.i. The output with the coarse head is

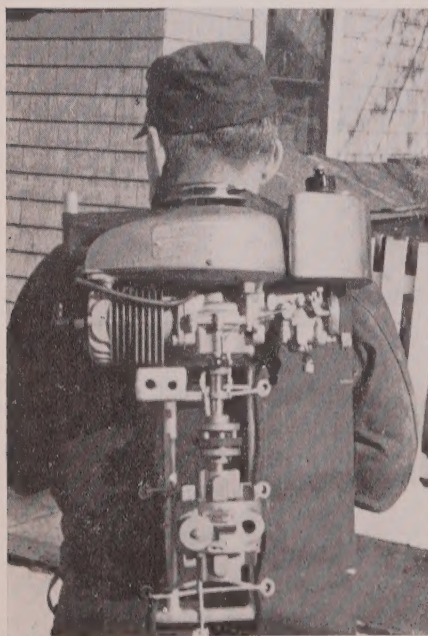


FIG. 3. Engine and compressor mounted on pack-frame.

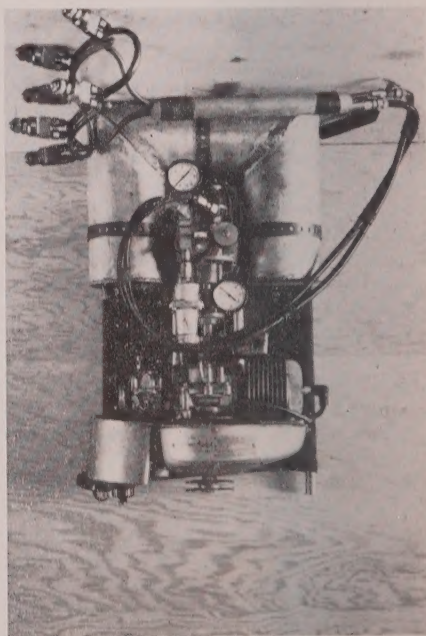


FIG. 4. Complete sprayer unit.



FIG. 5. Sprayer in operation.

18.75 gal. per hour; with the fine head, 15.75 gal. per hour (22.5 and 18.9 U. S. gal.).

The performance of this type of machine has been thoroughly assessed and reported elsewhere (Brown and Watson, 1953). The present model has the advantage of portability, which makes it available for biting-fly control in such situations as logging operations, where fallers work far in advance of any trails. Fully loaded with fuel and insecticide, the unit weighs 58 lb. When it is in use the load of insecticide, about 18 lb., is used up in eight minutes. Since the machine

is then set down for reloading, excessive fatigue in the operator is unlikely. If a penetration of 100 yd. downwind be assumed, with the operator making a speed of 1 m.p.h. in heavy bush, a single load would treat 6.6 acres. In open country, with favourable conditions, this coverage could be greatly increased.

SUMMARY. A portable, back-pack mist sprayer for control of adult biting-flies is described. The unit is power-driven, holds two imperial gallons of insecticide, and has an output of 15.75 to 18.75 gal. per hour. It is designed especially for use in areas where roads and trails are lacking, and weighs about 58 lb. when fully loaded with fuel and insecticide.

ACKNOWLEDGMENTS. The author wishes to express his indebtedness to Mr. C. N. Husman, U. S. Department of Agriculture, Bureau of Entomology and Plant Quarantine, Orlando, Fla., who was generous with information on details of the prototype, and to Mr. Bert Ward, Ward Power Saws Ltd., Kamloops, B. C., who carried out the mechanical work involved.

References

- BROWN, A. W. A., and WATSON, D. L. 1953. Studies on fine spray and aerosol machines for control of adult mosquitoes. *Mosquito News* 13:81-95.
- HUSMAN, C. N. 1953. A light pneumatic sprayer for installation on vehicles. *Mosquito News* 13:134-38.

DIURNAL SWARMS OF *CULEX TERRITANS* WALKER, AND THE CREPUSCULAR SWARMING OF *AÈDES* ABOUT A SMALL GLADE IN ALASKA

W. C. FROHNE * AND R. G. FROHNE

Recent publications on swarming of male malaria mosquitoes (Belkin *et al.*, 1951; Muirhead-Thomson, 1951; Senior-White *et al.*, 1953; Wharton, 1953) reaffirm, it seems to us, the direct relationship between swarming and mating, which was challenged by Nielsen and Greve (1950). The shocking paucity of knowledge on the habits of adult male mosquitoes is underlined. To observe the totally unrecorded swarming and mating of the commonest Malayan *Anopheles*, for example, Wharton had only to step out "on the open lawn in front of the Institute (for Medical Research) bungalow" where, we are told, *A. philippinensis* swarms "with few exceptions were found on every night throughout the year when they were sought." Nevertheless, actual observation of mating mosquitoes in the brief tropical twilight is extremely difficult (Senior White, l. c., p. 171).

The purpose of this communication is to contribute to knowledge from Alaska where swarms are also commonplace and rather more easily observed in the persistent subarctic twilight. Mating at very high rates has been observed in Alaskan swarms (Frohne & Frohne, 1952). In contrast to the brief swarming period characteristic of tropical mosquitoes, northern species commonly swarm an hour or more. Bates (1949) suggests that strictly diurnal mosquitoes (tropical), whose habits might be observed in the light of day, probably do not swarm. It is therefore of interest to report diurnal swarms of an Alaskan mosquito, *Culex territans*, which we encountered in the afternoon while watching mating swarms of the blackfly, *Simulium venustum*.

Location of an area in which to study swarming conveniently near to camp was done by guesswork early in the spring. We were unfamiliar with the region before the spring mosquito larval survey. The small study area near Chitina, which was subsequently inspected for swarms on favorable evenings all summer, was selected in May when wigglers of the rare and local *Aedes pseudodiantaeus* Smith 1952 were dipped in an adjacent quaking bog. We were not rewarded with swarming of *pseudodiantaeus* but there were swarms of *Aedes communis* and *cataphylla*, and of several dance flies, midges, and a crane fly in a glade amongst willows, alders, and spruces. *Aedes excrucians* swarmed close by the bog, but, so far as we know, only on the evenings of June 20 and 21. The afternoon swarms of *Culex territans* took place about half a mile away on a bluff overlooking the Copper and Chitina rivers. Since further observations at Chitina will be delayed for several years it appears worthwhile to record our preliminary findings.

Culex territans, DIURNAL SWARMS. We have seen no references to swarming of any of the *Culex apicalis* Adams complex; Marshall (1938) stated "no information appears to be obtainable." Six swarms were observed August 27 and 28 in the afternoons on the slopes of the Copper River bluff above three pale-leaved scrubby willows and a clump of poplar suckers. The earlier date there were three swarms over particular isolated willows, two of which were sites used again on the 28th. The swarms had a definite focus just over the bushes but individual mosquitoes moved up and down from about 7 to 15 feet above the ground at the foot of the tree. These males emerged from and retreated into the foliage below. No females

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were seen. Although the largest swarm numerically had 40-50 participants for 20-30 minutes of the swarming period—before 3:30 p.m. (Alaska Standard Time) to 5:45—the swarms were usually very small. About three to six mosquitoes were constantly changing off with others from below to maintain the swarm. Netting the active males had no lasting effect; the swarm reappeared in a minute or two. All swarms broke up or played out entirely before 6 p.m. both days.

Weather was similar on August 27 and 28 except that it was warmer, 17 degrees C. at the ground at 5:30 p.m. August 27, and cooler, 13 degrees, the following afternoon. After heavy night rains, morning sunshine preceded afternoon cloudiness with scarcely any breeze. There was no sunshine either afternoon but light reflection from the white clouds was considerable. Insect activity on the bluff was unusually great that day and included swarming of the blackfly, *Simulium venustum*.

The peak of *C. territans* emergence in the region occurred about July 15, more than a month before these observations were made. It is not unlikely that these small swarms were relicts composed of old males. No later mosquito swarms were found August 29-September 2 when frosts set in.

SWARMS OF *Aedes communis*. The most abundant mosquito of the area was seen swarming four evenings in the latter half of June in a secluded recess of the margin of the glade among alders, willows, and a high spruce. Wesenberg-Lund (1920-21) has described similar little swarms in the "deep shadows of the trees." He saw such swarming and mating "at every time of day."

On June 16 at about 8:30 p.m. a small swarm of approximately 15 males was found in the glade recess at 8-10 feet elevation. It persisted until nearly 9:15. Observation was difficult, but two undoubted mating pairs were seen, one of which was secured. After a light rain in early afternoon the evening had been warm and calm.

Upon our return June 19 at 8:15 p.m. after a two-day absence, a dance fly, *Rhamphomyia* sp., was caught carrying a male mosquito near a much larger swarm of 50-100 males at the identical site. Mating was seen in this swarm; 15 pairs were counted in 20 minutes. Instead of flying upwards like *Aedes punctator*, the copulating pairs of *communis* dropped through the swarm. Quite possibly other pairs departing laterally in the foliage were overlooked. The weather was fine with a bright sunset, no wind, and thunder-showers in early afternoon, but the evening was cool: 11 degrees C. at 8:20, and 8 degrees at 9:35 when swarming stopped.

June 20 was warm before afternoon showers led to a cool evening: 12 degrees C. at 8 p.m., 9 degrees at 9:30. *Communis* swarmed as before with 30-40 males active at any moment for over an hour, but there appeared to be no mating.

June 21 was a hot afternoon (exceeding 30 degrees C.), cooled by brief thunder-showers. The evening was again cool: 14 degrees C. at 8:30, 10 degrees at 9:30. The swarm was consistently larger than the day before, but only three copulations, one with a supernumerary male interfering, were observed in 15 minutes close watching. The glade was not visited again until June 27, a windy evening with no swarms. Finally on June 28 at 8:45 p.m. an ultimate, lone male *communis*, swarming alone at the site was taken.

***Aedes excrucians* SWARMS.** In a paragraph on male swarming habits of mosquitoes at Whitehorse, Dyar (1920, cited in Bates, 1949) refers to "an occasional *excrucians*, high up and flying wildly." We have found no other references to swarming of *excrucians*.

On June 20 at 9:50 p.m. after cessation of *communis* swarming at the glade, two large *excrucians* swarms of several hundred males each were observed in a clearing about 40 yards from the quaking bog. These males were presumably relatively young because larvae of the species were still common in the bog June 3. The grass and weeds in the clearing were

scarcely more than a foot high and no bushes or other objects stood in any apparent relationship to the swarms which were moving about horizontally over radii of 8 or 10 feet. The foci were relatively high, 10–20 feet. Visibility was unfortunately low, but in collecting specimens two copulating pairs were distinctly seen, and one of the females was caught. The pairs both descended slowly, i.e. there was evidently no nuptial flight, although copulation began high in the air. It was cool: 9 degrees C. at 9:30 (cf. weather of that date under *communis*).

The following evening *excrucians* swarms were sought all around the bog periodically from 8 to 9:30 when a large diffuse swarm of several hundred males materialized at the clearing site of the night before. However, this third swarm had no persistent focus at all. Transitory concentrations involving hundreds of males came together and dispersed at various points over a radius of 20–30 feet and usually 10–12 feet in the air. These males were all “flying wildly,” and they produced an audible hum. Conditions for observing were unfavorable. No mating was seen. The site was next visited June 27 and then checked from time to time in July and August but no other *excrucians* swarms were found.

Aedes cataphylla. Dyar (1928, cited in Bates, 1949) reported “the males swarm high over spaces between bushes or small trees in open country.” To Wesenberg-Lund (1920–21) *cataphylla* swarmed precisely like *communis* (v.s.).

The larval dipping showed *cataphylla* adults were already on the wing late in May, but it was not until July 18 that a swarm of this species was found. At 8:40 p.m. about 30 males were swarming 12–15 feet above the ground in the identical recess of the glade where *communis* had swarmed nearly a month before. There was no mating, apparently, so that it is reasonable to assume the swarm was a non-functional one composed of old males. It was a cloudy day with a moderate, variable wind, rather cool but still 11.5 degrees C. at 9 p.m. There was intense

insect activity, manifested especially by mosquitoes, that evening. No other swarms of *cataphylla* were found, but on July 20 an individual male was caught in the glade recess rising and falling in the typical swarming behavior.

SUMMARY. Repeated inspections for male mosquito swarms were made at sunset around a small bog near Chitina, Alaska during the summer of 1953. The following crepuscular species were observed swarming:

- (1) *Aedes communis*, the latter half of June, in a secluded recess of a small glade;
- (2) *Aedes cataphylla*, about a month later, in the same location;
- (3) *Aedes excrucians*, June 20 and 21, in a large, open clearing.

Copulation at low rates was seen in some of the swarms of *Aedes communis* and *excrucians*.

While observing afternoon swarms of the blackfly, *Simulium venustum*, late in August diurnal swarms of the mosquito, *Culex territans*, were discovered. This mosquito, at least as to swarming of males, is apparently non-crepuscular.

References

- BATES, MARSTON. 1949. The natural history of mosquitoes (p. 54). 379 pp. New York.
- BELKIN, J. N., EHMANN, N., and HEID, G. 1951. Preliminary field observations on the behavior of the adults of *Anopheles franciscanus* McCracken in southern California. Mosquito News 11(1):23–31.
- FROHNE, W. C., and FROHNE, R. G. 1952. Mating swarms of males of the mosquito, *Aedes punctator* (Kirby), in Alaska. Mosquito News 12(4):248–251.
- MARSHALL, J. F. 1938. The British mosquitoes (p. 302). 341 pp. London.
- MUIRHEAD-THOMSON, R. C. 1951. Mosquito behavior in relation to malaria transmission and control in the tropics. 219 pp. London.
- NIELSEN, E. T., and GREVE, HANS. 1950. Studies on the swarming habits of mosquitoes and other Nematocera. Bull. Ent. Res. 41(2):227–258.
- SENIOR-WHITE, R. A., LEWIS, G., and LEE, P. 1953. On swarming and mating in *Anopheles aquasalis* Curry. Bull. Ent. Res. 44(1):163–173.
- WHARTON, R. H. 1953. The habits of adult mosquitoes in Malaya. IV. Swarming of anophelines in nature. Ann. Trop. Med. & Paras. 47(3):285–290.

A NOTE ON IRRIGATION DROP STRUCTURES AS BREEDING SITES OF BLACKFLIES IN WESTERN NEBRASKA (DIPTERA: SIMULIIDAE)

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During the summer of 1953, several farmers living a few miles south of Mitchell, Nebr., on highway 86, complained to a veterinarian in Mitchell that their cattle were being greatly annoyed by attacks of biting flies. The veterinarian requested assistance from entomologists at the Mitchell Field Station of the Communicable Disease Center, U. S. Public Health Service, in the identification of these flies.

Several net collections of adult flies were made by the writer during August 1953, and two species of Simuliidae were found to be attacking the cattle. The blackflies were identified as *Simulium vittatum*

Zett., and *Simulium griseum* Coq. It was observed that these flies were most numerous around the cattle in the evening at sunset and usually attacked the ears.

It is generally known that Simuliidae are associated with swift flowing water. To find the breeding sites, a survey of water areas was made within a radius of 1 mile of the farms where the blackflies were biting. All of the water found in this area was connected either directly or indirectly with irrigation and involved canals, concrete drop structures, farm laterals, drainage ditches, and seepage areas.

Blackfly larvae and pupae were found in



FIG. 1. The rapid flow of irrigation water over concrete drop structures, used to lower water surfaces and prevent erosion where ditch flows are carried down relatively steep slopes, provides ideal breeding sites for blackflies.

small numbers along the edges of the main canals, and in large numbers in the concrete drop structures (fig. 1). A total of 206 drop structures was located and examined in the survey area, of which 193, or 93 per cent, contained Simuliidae. Collections of *S. vittatum* and *S. griseum* larvae and pupae were made from several of the drops on July 22 and August 14, 1953.

In this particular area, irrigation water is delivered to the user under the rotation method whereby he receives water for definite periods of time and is without water during the intermediate periods. Consequently water was sometimes shut out of laterals for a period of several days. When this happened sufficient water usually remained in the concrete apron of each drop structure to permit the blackfly larvae and pupae to survive until the water was turned into the lateral again.

When water was not flowing in the lateral it was possible to estimate the density of the Simuliidae population in the concrete aprons. This was done by measuring a 1-foot square area on the side of an apron and counting the number of larvae and pupae attached to the concrete. In late August two 1-foot square areas were sampled in 10 different aprons.

The larvae and pupae in these samples ranged in number from 2 to 37 with an average of 18 per square foot. Each apron was found to measure approximately 28.5 square feet so that the breeding potential of a single drop structure was 513 Simuliidae. On this basis it is estimated that the 206 drops contained in excess of 105,000 blackflies.

The blackflies were identified by Dr. Alan Stone of the Division of Insect Detection and Identification, Bureau of Entomology and Plant Quarantine, Washington 25, D. C.

A TECHNIQUE TO FACILITATE IDENTIFICATION OF MOSQUITOES IN LIGHT TRAP COLLECTIONS

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Light traps are used extensively for sampling adult mosquito populations; however, the large catches which are frequently taken make the routine task of identifying and counting the specimens a time-consuming and tedious process. The technique described below has greatly facilitated the processing of light trap collections of mosquitoes which have been made in connection with studies undertaken in irrigated areas of several western states.

The technique involves the use of (1) a wide-field stereoscopic microscope, (2) a manually operated stage consisting of a

base plate and sliding horizontal trough, and (3) a nine-unit laboratory counter.¹ The base plate of the manual stage is constructed so that it replaces the removable glass stage on the microscope. Mosquitoes from the light trap collections are thinly scattered over the bottom of the trough which operates in the center of the field. By slowly moving the trough beneath the objective the mosquitoes may be identified and recorded on the laboratory counter

¹ #A-2030 Clay-Adams Co., Inc. The trade name is used as a means of identifying the product. Its use does not constitute endorsement by the U. S. Public Health Service.

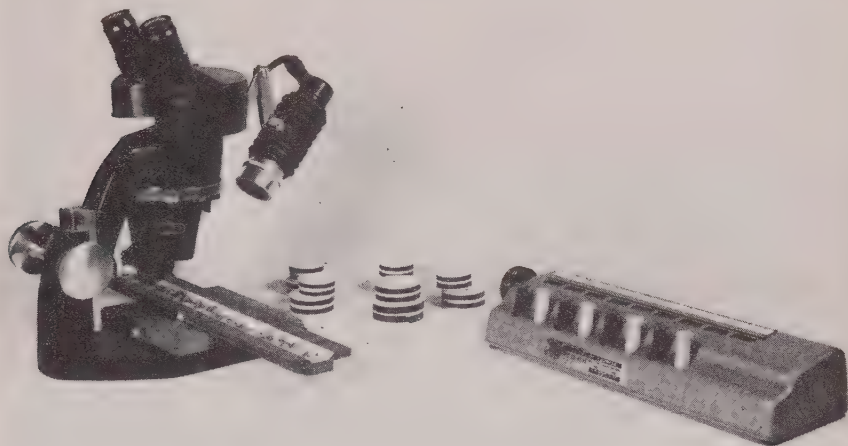


FIG. 1. Stereoscopic microscope equipped with manual stage and nine-unit laboratory counter used for identifying and counting mosquitoes from light-trap collections.

(fig. 1). Males and females of four species and their total can be recorded on the nine-unit counter. With a little practice, the counter can be operated by touch, allowing undivided attention to be devoted to the microscope field.

Construction details of the microscope stage are shown in figure 2. The trough and base plate are constructed of $\frac{1}{8}$ " and $\frac{1}{4}$ " tempered masonite glued together. The trough used in this laboratory is 12 inches long with 1-inch divisions. These divisions are useful in determining which mosquitoes have been identified in the event of an interruption. The width of the trough is dependent on the field covered by the combination of objectives and eye-pieces normally used for mosquito identification. The sides of the trough are sloped to prevent shadows and the bottom may be painted white or black, depending on individual preference.

It has been estimated that the time required to identify and count the mos-

quitoes in the larger trap collections is reduced as much as 50 per cent by the use of this technique. The technique removes much of the tedium of mosquito counting and reduces the handling of individual specimens. It may be used for unsorted trap collections where sorting, identifying, and counting are all accomplished in one operation. This technique is adaptable for use in handling other kinds of insects collected in light trap samples.

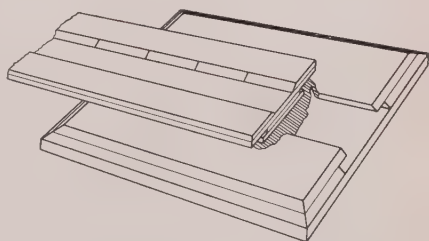


FIG. 2. Perspective view showing construction details of the manually operated microscope stage.

NOTES ON THE *CULEX VIRGULTIS* COMPLEX (DIPTERA: CULICIDAE)¹

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INTRODUCTION. On October 12, 1953 the writer collected many larvae and several egg rafts of a species of *Culex* at Palmetto State Park, about 5 miles south of Luling, Texas. Some of the egg rafts hatched and series of larvae as well as many adults were obtained. By using available keys and descriptions, the writer found it impossible to identify positively the species involved. Consequently, a series was sent to Dr. Alan Stone at the National Museum for a comparison with types. Dr. Stone kindly identified the specimens as *Culex virgultis* Theobald.

Until recently the name, *Culex declarator* D. & K., has been used for certain members of this group. Lane (1951), however, after an examination of types in the United States National Museum and in the British Museum, synonymized *C. declarator* under *C. virgultis*.

Culex virgultis as at present recognized has a very wide distribution: from Texas south through Mexico, Central America and to Uruguay in South America. It also occurs in some of the islands of the West Indies (Dyar 1928; Kumm, Komp and Ruiz 1940). This species is quite variable, which is doubtless responsible for the large number of synonyms, and it causes the identification of the species in different parts of its range to be quite difficult. Additional studies may cause the group to be broken into two or more species, but at the present state of our knowledge it appears best to consider the group as a single species or species complex.

So far as could be determined, this species has been reported only a few times from the United States, and it has consequently been considered rare in this country. In view of the large number of specimens recently collected, and the confusion existing relative to this group, the writer has thought it worthwhile to review and bring up to date available information relative to the complex. It has also been thought advisable to point out briefly how the specimens at hand differ from current descriptions. These descriptions and the accompanying illustrations should be of assistance to other workers in identifying members of the *C. virgultis* complex found in Texas.

HISTORICAL. In the following brief discussion of the *C. virgultis* complex, only those publications are cited which seem to be of most importance. A more complete bibliography may be found in Dyar (1928) and in Matheson (1944).

Culex virgultis was described by Theobald (1901) from two male specimens collected at Rio de Janeiro, Brazil in 1899. Dyar and Knab (1906) described *Culex declarator* from larvae collected in Trinidad, West Indies. Dyar (1918) after studying larger series, synonymized *C. jubulator* D. & K., *C. dictator* D. & K. and *C. vindicator* D. & K. under *C. declarator*. He also made *proclamator* D. & K. a variety of *declarator*, and synonymized *inquisitor* D. & K. and *revelator* D. & K. under this variety. At this time, Dyar stated that features he had previously used to distinguish these various groups became less distinct as more specimens were studied. The features mentioned included the length and the number of pecten teeth on the siphon, the position of the siphonal hairs and the presence or absence of white-tipped tarsi in the adult.

¹ This investigation was supported in part by a research grant, E-507, from The Microbiological Institute of the National Institutes of Health, Public Health Service; and by The University of Texas Research Institute. Drawings by Grace Hewitt.

Bonne-Wepster and Bonne (1921) after collecting in Surinam (Dutch Guiana) for several years, compared their specimens with types in the United States National Museum and the British Museum. On the basis of these studies, these workers considered *C. declarator* and *C. virgultis* as identical. Dyar (1921a) accepted this interpretation, but later (1921b) restored *declarator* to specific rank. At this time, Dyar listed previously recognized synonyms, and in addition, reduced *proclamator*, a previously recognized variety, to a synonym of *declarator*. In his 1928 monograph Dyar recognized both *C. virgultis* and *C. declarator* as valid species, and so far as could be determined, both groups were considered distinct until the study by Lane noted above.

THE PRESENT STUDY. It was mentioned previously that *Culex virgultis* (= *declarator*) has been reported from the United States only a few times. The most recent report noted was by Rueger and Druce (1950) who found eight adults from a total of almost 300,000 specimens collected at 32 army installations in Texas over a period of two years. *C. virgultis* came from Fort Sam Houston (Baxar County) and from Harlingen Army Air Field (Cameron County). Dyar (1925; 1928) states that *C. virgultis* (called *C. declarator* in these publications) has been taken from Brownsville, Texas, but gives no indication of the number of specimens or the type of habitat from which the mosquitoes were obtained. Fisk and LeVan (1940) also collected the species at Brownsville in light traps. They did not state the number of specimens obtained.

The larvae and egg rafts collected by the writer were from two sites within a few hundred yards of each other, both in Palmetto State Park (Gonzales County), Texas. Most of the larvae and all the egg rafts were found in cow tracks and other small puddles on the bank of a small woodland stream. Other species obtained at the same time included *Culex restuans* Theobald, *C. thriambus* Dyar, *C. territans* Walker and *Anopheles pseudopunctipennis* Theobald. A few adults of *C.*

virgultis also emerged from larvae collected from a seepage area on the bank of the San Marcos River. Associated species included *C. tarsalis* Coq., *C. thriambus* and *Uranotaenia syntheta* Dyar and Shannon.

From these collections, more than 50 larvae were obtained for study and a similar number of adults emerged in the laboratory. The following descriptions and the accompanying illustrations are based upon a study of this material.

The most recent relatively complete descriptions of this species (called *C. declarator* in these publications) of which the writer is aware, are those of Matheson (1944) and Yamaguti and LaCasse (1951). The descriptive features emphasized are those in which the writer's specimens differ from those given in these publications and Dyar (1928). Since most *Culex* are easiest to identify from larvae or male genitalia, only these points are discussed.

Larva: (fig. 1). From the standpoint of key features, perhaps the most important variation in the larva is the position of the siphonal hairs in relation to the pecten. Dyar (1928) states that the first siphonal hair may be either within or outside the pecten; in his key to larvae, *declarator* is distinguished from similar larvae by the first hair being close to or within the pecten as opposed to the first hair being some distance from the pecten. Matheson (1944) quotes Dyar's description of the larva, but in his key includes *declarator* with those species in which the basal tuft arises within the pecten. Yamaguti and LaCasse describe and figure a larva from Nicaragua in which the distal pecten teeth overlap the basal tuft.

There is some slight variation in the position of the basal siphonal tuft in the writer's specimens, but in all cases the basal tuft arises well beyond the pecten.

The authors noted above state that the pecten occurs on the basal one half of the siphon; in most of the writer's larvae, the pecten occurs only on the basal one third. Yamaguti and LaCasse figure the individual pecten tooth with several short

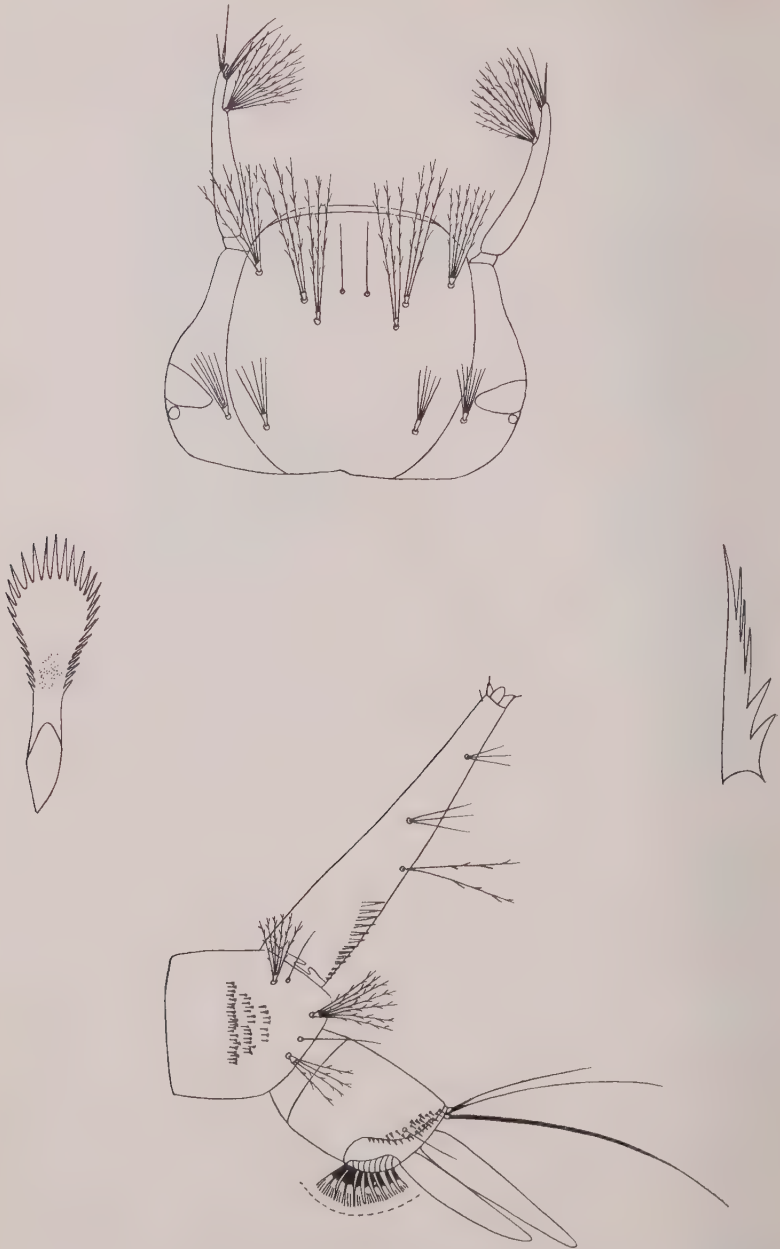


FIG. 1. Larval structures of *Culex virgultis* Theobald. Specimens collected near Luling, Texas. Upper, head. Lower, terminal segments. Left middle, representative comb scale. Right middle, representative pecten tooth.

denticles. The individual pecten tooth of the Texas larvae has much longer denticles. The upper pair of anal gills of the larvae of Yamaguti and LaCasse are shortest in the illustration, whereas in our larvae the lower pair are shortest.

Additional variations of minor importance in the Texas specimens include the number of branches in both the head hairs and in the siphonal hairs.

Despite the variation existing in certain features of the larvae of *C. virgultis*, the species should usually be one of the easiest in the United States to identify correctly in the larval stage. It is the only species of *Culex* known from this country which routinely has only three pairs of hairs on the siphon. A few other species may occasionally exhibit this feature as a variation (e.g. *C. nigripalpus* Theobald) but in most cases four or more pairs of tufts or single hairs occur.

Male Genitalia: (fig. 2). At least two differences are evident in the genitalia of the writer's specimens as opposed to the illustrations of Dyar (1928) and

Yamaguti and LaCasse (1951). In both these publications the appendages of the subapical lobe are illustrated as consisting of a relatively symmetrical leaf, three hooked rods, a flattened rod slightly expanded distally and a seta. In the Texas specimens the leaf is asymmetrical and the flattened rod is much more expanded distally.

Obviously, additional studies are needed on this very variable complex of mosquitoes.

Literature Cited

- BONNE-WEPPER, J. and BONNE, C. 1921. Notes on South American mosquitoes in the British Museum. *Ins. Ins. Mens.* 9:1-26.
- DYAR, HARRISON G. 1918. A revision of the American species of *Culex* on the male genitalia. *Ins. Ins. Mens.* 6:86-111.
- DYAR, HARRISON G. 1921a. Comments on the preceding paper. *Ins. Ins. Mens.* 9:26-31.
- DYAR, HARRISON G. 1921b. Note on *Culex declarator*. *Ins. Ins. Mens.* 9:194-195.
- DYAR, HARRISON G. 1925. The mosquitoes of Panama. *Ins. Ins. Mens.* 13:101-195.
- DYAR, HARRISON G. 1928. The mosquitoes of the Americas. *Carneg. Inst. Wash. Publ.* 387.
- DYAR, HARRISON G. and KNAB, FREDERICK. 1906. The larvae of Culicidae classified as independent organisms. *Journ. N. Y. Ent. Soc.* 14: 169-230.
- FISK, FRANK W. and LEVAN, JAMES H. 1940. Mosquito collections at Brownsville, Texas. *Journ. Eco. Ent.* 33:944-945.
- KUMM, HENRY W., KOMP, W. H. W. and RUIZ, HORATIO. 1940. The mosquitoes of Costa Rica. *Amer. Journ. Trop. Medicine* 20:385-422.
- LANE, J. 1951. Synonymy of neotropical Culicidae (Diptera). *Proc. Ent. Soc. Wash.* 53: 333-337.
- MATHESON, ROBERT. 1944. Handbook of the mosquitoes of North America, second ed. Comstock Pub. Co., Ithaca, New York.
- RUEGER, MYRTLE E. and DRUCE, STENNETTE. 1950. New mosquito distribution records for Texas. *Mosquito News* 10:60-63.
- THEOBALD, FREDERICK VINCENT. 1901. A monograph of the Culicidae or mosquitoes, Vol. 2. British Museum of Nat. History, London.
- YAMAGUTI, SATYU and LACASSE, WALTER J. 1951. Mosquito fauna of North America, Part IV, Genera *Culex* and *Deinocerites*. Office of the Surgeon Hq. Japan Logistical Command APO 343.



FIG. 2. Apex of sidepiece or basistyle of male of *Culex virgultis* Theobald. Specimens collected near Luling, Texas.

RAPID PERMANENT MOUNTS OF MOSQUITO LARVAE WITH CREOSOTE-ALCOHOL, PHENOL-ALCOHOL, LACTOPHENOL AND POLYVINYL ALCOHOL

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While engaged in malaria control activities in Liberia, West Africa, the writer has found it necessary to experiment with shorter and less involved methods of mounting mosquito larvae and other stages of mosquitoes, so that local technicians being trained could prepare slides with a minimum of handling and in the shortest possible time.

In a previous article (1953) the use of beechwood creosote as a clearing agent, and euparal, diaphane, Piccolyte, Clarite, Permount, and Canada balsam as mounting media, were discussed. Briefly, the procedure involved killing the larvae in hot water, dehydrating with 70 per cent alcohol and 95 per cent alcohol, clearing with beechwood creosote, and then mounting in one of the media listed above.

Experiments were undertaken to attempt to combine some of these steps so as to shorten the procedure and still obtain the slides desired. Trials were also made with lactophenol and polyvinyl alcohol, two substances not previously mentioned. Each method is discussed separately.

CREOSOTE-ALCOHOL AND PHENOL-ALCOHOL METHOD. In this procedure, either beechwood creosote or pure liquid phenol, U.S.P., may be used, as the results are identical. Seventy cc. of pure ethyl alcohol are mixed with 25 cc. of either beechwood creosote or phenol. The alcohol acts as the dehydrating agent, and the creosote or phenol as the clearing agent, both actions taking place simultaneously. The living larva is dropped into this mixture and dies immediately in an extended

condition. It may also be transferred from 70 per cent ethyl alcohol, or may be killed first in lactophenol. At the end of two hours the specimen will have been sufficiently dehydrated and partially cleared. It is then transferred to a Syracuse watch glass containing pure beechwood creosote, where it will become fully cleared in one or two minutes, occasionally longer. It is now ready for mounting.

The larva is lifted up with a small spatula or fine loop of wire, and is transferred to the center of a clean slide. Several drops of euparal or diaphane are placed upon it with a medicine dropper. In culicine larvae and in certain anopheline larvae the posterior portion is severed with a razor blade, and the lateral aspect is brought into view. In culicines the siphon should be flopped over on its right side. In anophelines either the right or left pecten may be viewed. Care should be taken to see that the head is not upside down, especially in anopheline larvae. Additional drops of euparal or diaphane are then applied in a square pattern the same size as the cover glass. If a round cover glass is used, the mountant should be shaped circularly.

If the cover glass is placed at an angle against one edge of the mountant, the moving edge of the mountant may sweep the severed posterior portion out of position. This is avoided or minimized by holding the cover glass directly over the specimen and parallel to the slide, and then dropping it vertically upon the larva. The severed portion will either remain in position, or may move to one side slightly.

When transferring the larva from water to the dehydrating-clearing mixture, no water should accompany the specimen.

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This is accomplished simply by picking up any number of larvae with a wide-opening medicine dropper, and pipetting them on to a sheet of toilet tissue or several layers of gauze. The water is absorbed rapidly, stranding the larvae. The tissue or gauze is then turned upside down and is touched to the surface of the mixture, thus transferring the larvae with a very minimum of water. When this is done rapidly no setae will be detached. If a Syracuse watch glass is used for the initial action, the mixture may be removed with a pipette after two hours and the pure beechwood creosote introduced. This avoids physical transfer of the specimen.

If the atmosphere is very humid, difficulty may be experienced with a whitish precipitate which forms at the outer edge of the mounted cover glass and proceeds inward toward the specimen. A precipitate may also form when the euparal or diaphane has been diluted too much. If this precipitate is allowed to remain, the mount will be spoiled. It may be removed at the same time that the slide is dried rapidly in an oven.

The newly prepared slide should be placed in a drying oven and kept for 30 minutes at 100 degrees F., or longer at a lower temperature. At the end of this time the precipitate will have been removed by the heat, and the mountant will be sufficiently thickened so as to permit immediate study of the specimen without danger of moving the cover glass. If desired, this procedure may be repeated the following day at the same temperature, but only for 15 minutes. The heat usually removes bubbles, providing there are not too many of them.

If the whitish precipitate originates from the specimen itself instead of from the edge of the mountant, this is an indication that the specimen has been insufficiently dehydrated, and should be replaced in the dehydrating-clearing mixture.

Only euparal or diaphane can be used in this method of mounting. It will not work with any of the xylene-soluble media mentioned above, as the contact of alcohol with xylene results in a precipitate within

the specimen. The larva may be left indefinitely in either the mixture or in the pure beechwood creosote. The latter may be used many times over. Mosquito eggs and pupae may also be mounted with this procedure. Egg rafts are easy to handle, but individual eggs must be transferred with care. A simple method of removing eggs from the water surface is to lower a small square of toilet tissue or lens tissue directly upon the eggs, which will stick to the paper. The tissue is then touched to the slide, and the eggs will adhere to its surface right side up. A cover glass may be used instead of a paper square for this purpose.

LACTOPHENOL AND POLYVINYL ALCOHOL METHOD. Mounting experiments were carried out with lactophenol and polyvinyl alcohol in order to verify their usefulness, and claims for permanence of the latter (1943). Lactophenol is prepared by mixing the following chemicals:

Phenol (absolute)	20 cc.
Lactic acid	40 cc.
Glycerine	40 cc.
Water	20 cc.

When larvae collected in the field are placed directly into lactophenol, they die immediately. This mixture, being somewhat viscous, prevents setae from being detached. Specimens may be stored indefinitely in lactophenol. A minimum amount of water should be added when transferring the larvae to the lactophenol, so as to prevent excessive dilution of the latter.

If it is not desired to carry lactophenol into the field, the specimens may be brought to the laboratory in water and transferred to lactophenol later. Larvae preserved in 70 per cent ethyl alcohol may also be transferred to lactophenol. When first placed into lactophenol the larvae sometimes shrink or contract, but after a short time they regain their original condition and become cleared. Lactophenol may also be used as a substitute for hot water when using other methods of mounting, as larvae which are killed in lactophenol do not turn dark.

The refractive index of lactophenol is such that the most minute structures are rendered visible with unusual clarity. For this reason, some entomologists have adopted the procedure of mounting larvae in lactophenol, and then ringing the cover glass with a mixture of dry Canada balsam and a paraffin wax of high melting point. Such mounts may be considered to be "indefinite" rather than permanent, as the lactophenol remains in a liquid state; however, if the seal is not broken these mounts will last for many years. Some writers designate lactophenol as a mountant instead of a clearing agent as such.

Polyvinyl alcohol mountant is prepared by mixing the following chemicals:

Stock polyvinyl alcohol . . .	56 cc.
Phenol (absolute)	22 cc.
Lactic acid	22 cc.

Polyvinyl alcohol may be purchased as a white odorless powder or in granular form. To prepare the stock solution, add 100 cc. of water to 15 grams of polyvinyl alcohol while stirring and heating at 80 degrees C. in a water bath. When it becomes as viscous as molasses, filter through several layers of gauze.

Living larvae may be mounted directly in polyvinyl alcohol mountant from water; however, many larvae thus mounted tend to contract, especially in the abdominal region, so that the body is shortened. The head also tends to recede into the prothoracic region. This contraction may be lessened by placing the living larva in a Syracuse watch glass containing polyvinyl alcohol mountant, prior to actual mounting on the slide. After one hour, the larva will have relaxed sufficiently so that the actual mounting may be initiated. Living larvae may be transferred in groups by following the procedure outlined in the previous section.

If the larva is mounted directly in polyvinyl alcohol on a slide, and the posterior portion is severed, there is a tendency for the viscera to emerge through the cut end because of telescoping and contraction of the abdominal segments. This is avoided to some extent by waiting 10

minutes before severing the posterior portion on the slide, or, as already suggested, by allowing the larva to remain in the mountant for one hour prior to mounting on the slide.

Polyvinyl alcohol is a clearing agent as well as a mounting medium, so that specimens will become cleared while the mount is hardening.

There is a tendency for minute bubbles to form when the polyvinyl alcohol mountant is applied to the slide with either a glass rod or swab stick. This results in an unsightly mount. The bubbles often arrange themselves along the sides of the larva. Such bubbles are prevented by using a medicine dropper as an applicator. Fill the dropper halfway with the mountant; then, holding the dropper against the slide, press the bulb very slowly. The mountant will ooze out without bubbles. Avoid dropping the mountant on the slide, as bubbles will then form.

Another hazard is too rapid lowering of the cover glass, resulting in minute bubbles along the sides of the larva. The cover glass should be lowered very gently, preferably vertically upon the specimen, after the mountant has been spread to the size and shape of the cover glass. If the amount of mountant has been underestimated, additional drops may be added from the upper edge of the cover glass, using a medicine dropper.

A considerable convenience is the easy removal of the mountant from slides and cover glasses. Merely dip slides or cover glasses in water and wipe dry.

Egg rafts, individual eggs, and pupae may also be mounted directly in polyvinyl alcohol mountant as described for larvae. It is not recommended for mounts of adults, however, as this mountant causes scales to come loose from the body and wings.

In humid areas, polyvinyl alcohol hardens very slowly if left to harden in air. An oven should be used to shorten the hardening time. Warm the slide in an oven for 30 minutes at 100 degrees F., or longer at lower temperatures. A 100-

watt bulb within a small wooden or metal box will usually provide sufficient heat for drying the mount. It is not recommended that a heating table or hot plate be used, as they tend to cause bubble formation. The heat should come from all directions, rather than just from below.

SUMMARY. Rapid mounting of mosquito larvae has been described. One technique involves 2 hours storage of the larva in a dehydrating-clearing mixture consisting of either 70 cc. of beechwood creosote and 25 cc. of 95 per cent pure ethyl alcohol, or 70 cc. of absolute phenol and 25 cc. of 95 per cent pure ethyl alcohol. Then the larva is cleared fully in pure beechwood creosote for several minutes, and mounted in either euparal or

diaphane. The second technique involves the use of lactophenol as a clearing agent or temporary mountant, and polyvinyl alcohol as a clearing agent and permanent mountant. In every case living larvae may be used directly without prior killing. Eggs, egg rafts, and pupae may be mounted also with these procedures. Heating of the finished slide in a drying or cooking oven at 100 degrees F. for 30 minutes assists materially in rapid drying of the mount.

Literature Cited

BURTON, G. J. 1953. Some techniques for mounting mosquito eggs, larvae, pupae and adults on slides. *Mosquito News* 13(1):7-15.

Downs, W. G. 1943. Polyvinyl alcohol: A medium for mounting and clearing biological specimens. *Science* 97:539.

SIMPLIFIED TECHNIQUES FOR THE CONTINUOUS REARING OF *CULEX TARSALIS* WITH ADDITIONAL NOTES AND OBSERVATIONS¹

ALEXANDER A. HUBERT, WILLIAM A. RUSH, AND JAMES M. BRENNAN

Since the preliminary report on the colonization of *Culex tarsalis* by Brennan and Harwood (1953), we have been able to refine somewhat the methods earlier used in maintenance of the Rocky Mountain Laboratory's stock colony. A sub-colony has been successfully established in a small cage in a window-equipped room of the insectary without controlled lighting, and a considerable amount of miscellaneous biological information has been accumulated. The report cited above is a necessary adjunct to this paper.

MAIN COLONY. The stock colony is still

housed in the large walk-in cage. Although there are strong indications that our strain of *C. tarsalis* is now well adapted to conventional rearing techniques, we are still continuing with a simplified conditioning process as a precaution against the loss of the colony. Temperature and humidity are maintained at about 70° F. and 70 per cent, respectively. Light is provided by overhead fluorescent tubes and by a rheostat-controlled 300-watt lamp now directed toward an upper corner of the room. A twilight period is initiated by extinguishing the ceiling lights, giving an exposure meter (Weston Master II) reading in the cage of approximately 6.5. After about 15 minutes, voltage to the rheostat-controlled lamp is rapidly reduced from 110

¹ From the U. S. Department of Health, Education, and Welfare, Public Health Service, National Institutes of Health, National Microbiological Institute, Rocky Mountain Laboratory, Hamilton, Montana.

to about 55. After another 15 minutes the lamp is extinguished and the room is left in darkness for 5 hours. The dawn period is eliminated and all lights are switched on. These time intervals and light intensities are apparently not critical.

Certain behavioral changes have become apparent between the tenth and the present estimated twenty-fourth generations. The mosquitoes feed more readily on humans entering the cage. Twilight swarming now begins at a greater light intensity and also more swarming occurs when the lights are turned on. In addition, the swarms are noticeably larger.

Yeast and dried milk have been eliminated from the diet of the larvae which are now supplied only with the high protein pellets. The initial feeding per pan of 300 to 500 larvae consists of about $\frac{3}{4}$ grams of pellet, a portion of which is crushed. Thereafter a whole pellet (about $\frac{1}{2}$ gram) is added every 3 or 4 days. Mr. Ian S. Lindsay, Defence Research Board, Suffield Experimental Station, Ralston, Alberta, has reported (personal communication) the successful establishment of a colony from our strain. He states that the larvae are fed ground whole wheat bread supplemented with whole milk powder and brewer's yeast rather than the high protein pellets, that air is bubbled through the larval medium, and that larval mortality has been about 2 per cent.

The percentage of rafts containing viable eggs has remained high and during the period of 11 March to 13 July showed an increase when 1392 rafts of 1607 deposited (87 per cent) contained viable eggs. A consideration of single day's production of viable rafts reveals the number of eggs per raft to be similar to the value previously reported, but a marked increase is noted in the number of eggs hatched per raft. A review of the data obtained from the rafts of May 22, 1953, to cite a specific example, shows that of 4418 eggs in 19 rafts, 4110 eggs hatched, a viability of 93 per cent. The average number of eggs per raft was 232.5. The minimum number and maximum number per raft were 73 and 352 respectively. It is inter-

esting to note that there was a 100 per cent hatch from each of these extremes.

The following experimental rearings suggest that the large amount of space provided by a walk-in cage may no longer be necessary.

SUBCOLONIES WITH CONTROLLED LIGHT. A secondary colony was started in a sleeve-equipped cage, 16 x 16 x 24 inches, with F_5 pupae from the principal colony. This subcolony, as well as the others mentioned in this section, is in the same room as the main colony, and is therefore subject to controlled light. Both guinea pigs and chickens have been used as sources of blood meals. In the first 9 months after its establishment this colony produced 765 egg rafts, of which 396 (52 per cent) contained viable eggs. This low viability level has been more than adequate for maintenance of the colony which is now in its approximate twelfth generation.

In another small cage of mosquitoes, guinea pigs only were used as a source of blood. This colony was started with eggs from the approximate F_7 generation of the stock colony, and is now in about its ninth generation.

Humans have been the only source of blood for mosquitoes in a third cage. This colony originated from a single egg raft from a female which had fed on human blood. During the first 4 months of the colony's existence 27 (84 per cent) of the 32 egg rafts produced contained viable eggs, a viability comparable with that of the main colony. The mosquitoes feed on the blood donor's arm which is held against the screen of the cage. This colony is now in approximately the ninth generation.

Another colony of mosquitoes was maintained through 3 generations in a cage of less than $\frac{1}{2}$ cubic foot volume. The only source of blood was a local garter snake (*Thamnophis* sp.) which was kept in the cage at all times. The experiment was discontinued upon death of the snake. The few egg rafts produced were very small.

SUBCOLONY WITHOUT CONTROLLED LIGHT. When the main colony was in ap-

proximately the seventh generation, several hundred first instar larvae were removed to a room having windows. It was desirable to determine whether a sub-colony could be established and maintained with a minimum of attention and effort. In all respects, except for the manner of obtaining eggs, the method followed duplicates that now used at this Laboratory in rearing *Aedes aegypti*.

In this room the temperature and relative humidity are about 77° F. and 70 per cent, respectively. No attention is given to the illumination, except that on dark winter days a point is made of leaving the artificial lights on during most of the working hours. The cage is the 16 x 16 x 24-inch size mentioned above. Guinea pigs are used as the only source of blood and are usually provided during the hours of daylight as often as necessary for maintenance of the colony. Occasionally it has been necessary to supplement the daylight feeding with a blood meal at night. Although feeding has been observed at all daylight hours, maximum feeding occurs with the onset of twilight.

The immature stages are handled essentially like those of the main colony. High protein pellets are the only food for the larvae. When pupation begins, the entire contents of the pan are poured into a smaller container which is placed inside the cage for emergence.

No accurate count was kept of the number of egg rafts or the number which hatched. However, in most generations 70 to 80 per cent of the rafts contained viable eggs. The critical period occurred in the F₃ generation, when only about 40 per cent of the rafts produced any larvae. This colony is now in the F₁₀ generation and is thriving. In a representative sample of eight F₈, well-formed, viable egg rafts produced over a period of several days, there was an average of 194 eggs per raft, with 97 per cent viability, or a hatch of 1511 from a total of 1550 eggs.

MISCELLANEOUS EXPERIMENTS AND OBSERVATIONS. The approximate length of the egg stage at room temperature was

determined for 22 rafts that were either seen during the act of oviposition, or were collected while they were still white. All hatched sometime during the third day. Of 8 white rafts collected at the same time, one hatched 54 hours later; the remainder hatched within the next 2 hours.

The results of limited experimentation to determine the optimum number of larvae per unit area and volume of water and optimum diet cannot yet be accurately interpreted because of variables not now understood. However, it was learned that high protein pellets alone are an adequate diet. A disturbing factor in such experimentation is the fact that in an occasional larval pan of a presumably identical series, the pellet material becomes scummy and a pellicle forms on the water surface with subsequent high larval mortality.

Repeated observations have indicated, as might be expected, that a blood meal is necessary for oviposition. It has been noted further that at 70° F. and 70 per cent humidity blood meals will be accepted as early as the third day after emergence, and that oviposition can occur as early as the fourth day after a blood meal.

We have observed that although up to 90 per cent of the females readily accept an initial blood meal when offered, usually no more than 3 per cent can be induced to refeed at a particular offering, nor more than 15 per cent throughout a course of repeated offerings. In virus studies with *C. tarsalis* in this Laboratory, average refeeding rates for caged lots have been less than 3 per cent, the greatest having been about 20 per cent, and the average refeeding rate for isolated individuals has been less than 10 per cent. The implications are highly significant in the epidemiology of an arthropod-transmitted disease, and of such consequence in experimental transmission that a special study is being made of the blood-feeding tropism with emphasis on the factors which stimulate refeeding.

In certain laboratory experimentation it is sometimes desirable to retard the development of stages in the mosquito life cycle. Although precise information is

not available at this time, preliminary studies have indicated that eggs and pupae can be held at about 32° F. for 10 and 4 days, respectively, and remain viable. Critical studies of this nature are currently in progress.

SUMMARY. Simplified methods of maintaining *Culex tarsalis* at the Rocky Mountain Laboratory are described. The percentage of viable egg rafts produced by the main colony remains high and at times has risen to 87 per cent.

Colonies can be maintained in small cages with or without controlled lighting conditions. Chickens, guinea pigs, humans, or snakes can be utilized as sole sources of blood, and high protein pellets alone are satisfactory larval food. These colonies, with the exception of the snake-fed colony, have all survived for at least 9 generations.

It was determined that at room temperature females will accept blood as early as 3 days after emergence, that the initial feeding rate is high but the refeeding rate is disproportionately low, that a blood meal is required for oviposition, that oviposition can occur as early as 4 days after

a blood meal, that eggs hatch on the third day after oviposition, and that the development of eggs and pupae may be retarded by refrigeration yet remain viable.

From the rearing techniques described it would appear that *Culex tarsalis* has, after several generations, become well adapted to insectary conditions. Methods which were inadequate for colonization from wild stock are now used successfully for maintenance of laboratory colonies. Thus, it is seen that the species can now be reared continuously in the absence of controlled light. It is also noteworthy, both from the biological standpoint and from that of laboratory convenience, that our strain of this naturally eurygamous species will mate successfully in confined spaces. It is of great interest to us that the more conventional rearing techniques can be applied so soon to a mosquito initially refractory to all attempts at colonization.

Literature Cited

- BRENNAN, JAMES M. and HARWOOD, ROBERT F. 1953. A preliminary report on the laboratory colonization of the mosquito, *Culex tarsalis* Coquillett. Mosquito News 13(2):153-157.

"It is our conviction that the pest mosquitoes should receive more attention from health authorities than they have in the past. Public health has become something more than the absence of disease. PHYSICAL EFFICIENCY AND COMFORT, ON WHICH MENTAL EQUANIMITY DEPENDS TO A SUBSTANTIAL DEGREE, MAY BE SERIOUSLY DISTURBED BY THE CONTINUED ANNOYANCE OF PESTIFEROUS MOSQUITOES WHICH MAY OR MAY NOT HAVE DISEASE-TRANSMITTING POTENTIALITIES." (George H. Bradley, U. S. Public Health Service, Communicable Disease Center, Atlanta, Georgia.)

) PICTORIAL KEYS TO THE MOSQUITOES OF
MEDICAL IMPORTANCEVI. PHILIPPINE ISLANDS¹DAVID R. COOK²

Bureau of Entomology and Plant Quarantine, Agr. Res. Serv., U.S.D.A.

The accompanying keys continue a series being prepared under a transfer of funds from the Department of the Army to the Entomology Research Branch. They are designed primarily to assist public health workers in rapidly separating and identifying the mosquito species of primary medical importance. The keys are so constructed that they separate the important species not only from each other, but also from all other species known to occur in the area. The author will welcome any suggestions and comments, particularly from persons having information on the faunas of the countries involved. Other keys have been published in *Mosquito News*, vol. 13, nos. 1, 2 and 4, and vol. 14, no. 1.

Anopheles minimus flavirostris, a mosquito found throughout the Philippines, is by far the most important and dangerous vector of malaria in the islands. It occurs primarily in foothill areas, and does not usually breed at altitudes over 2000 feet. Larvae are found in slowly running water along the shaded edges of rivers and streams, commonly in association with roots and floating twigs of bamboo. Adults frequently enter houses at night, but leave soon after they become engorged and rest during the day beneath eroded stream banks, under buildings, and along stone walls. *Anopheles mangyanus*, closely related in morphology and biology to *A. minimus flavirostris*, likewise breeds in clear, slowly running water in foothill regions at altitudes not exceeding 2000 feet. Larvae are found in both shaded and sunlit situations. The importance to

malarial transmission of this species is still somewhat in doubt, since little is yet known of the biting habits of the adults. *Anopheles filipinae*, another close relative of *A. minimus flavirostris*, breeds in either sunny or shaded, clear or muddy water in rivers, flowing irrigation ditches, pools and lakes. This species may be a vector of malaria in the Philippines, for it has been found in large numbers in northern Luzon in the presence of abundant malaria. Neither *Anopheles maculatus* nor *Anopheles leucosphyrus* is known definitely to transmit malaria in the Philippines. The former species, commonly encountered breeding in various situations at altitudes up to 5000 feet, is included in the key because of its potential importance as a malaria vector, since it is a dangerous one in Malaya and certain areas in the Netherlands Indies. The larvae of *A. leucosphyrus* are often found in temporary collections of water such as wheel ruts and foot prints in open shade, and the adults bite man readily. This species is a proven vector in parts of Assam, Burma and North Borneo.

In addition to the species already mentioned, the following *Anopheles* have been recorded from the Philippines, or are suspected of occurring there: *aconitus*, *aitkenii aitkenii*, *aitkenii bengalensis*, *annularis*, *baezai*, *barbirostris*, *cristatus*, *gateri*, *gigas formosus*, *hyrcanus pseudosinensis*, *insulaeflorum*, *kochi*, *kolambuganensis*, *karwari*, *lesteri*, *leucosphyrus balabacensis*, *leucosphyrus leucosphyrus*, *leucosphyrus riparis*, *lindesayi benguetsensis*, *litoralis*, *ludlowii*, *minimus minimus*, *nigerrimus*, *parangensis*, *philippinensis*, *pseudobarbirostris*, *subpictus subpictus*, *subpictus indefinitus*, *sundaicus*, *tessellatus* and *vagus*.

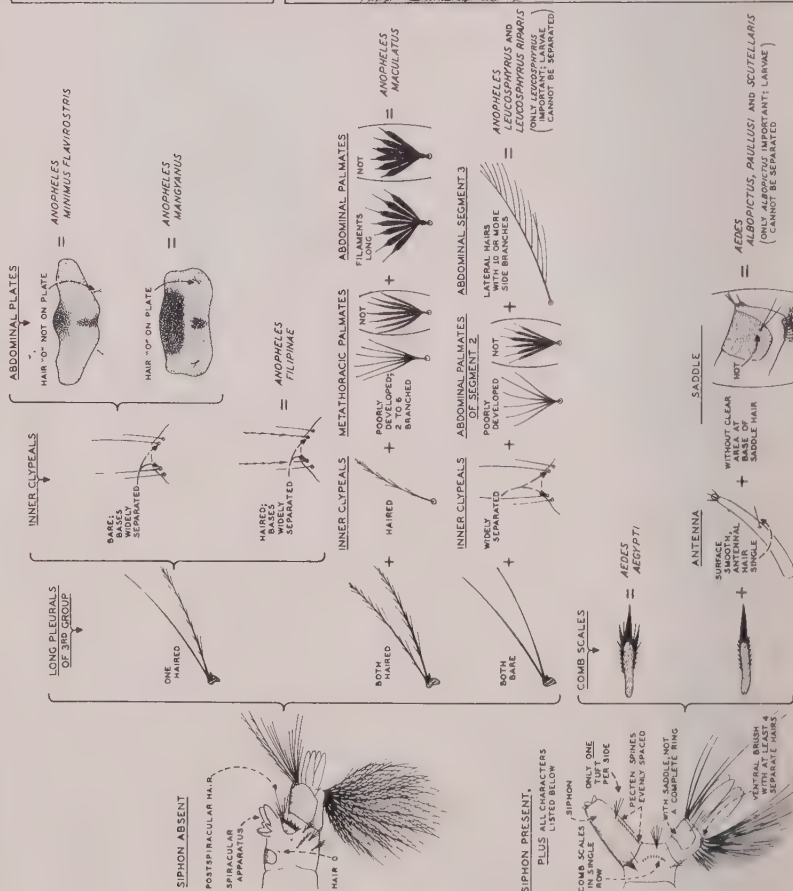
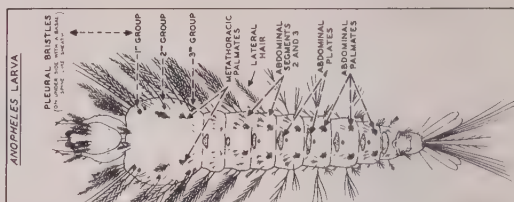
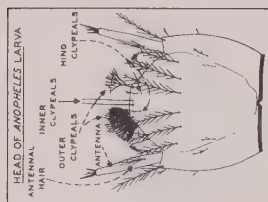
¹ Keys were drawn by Sally D. Kaicher.² Present address: Department of Biology, Wayne University, Detroit 1, Mich.

MOSQUITOES OF MEDICAL IMPORTANCE — PHILIPPINE ISLANDS

IMPORTANT
SPECIMEN MUST HAVE
CHARACTERS LISTED
FOR THAT SPECIES

FULL-GROWN LARVAE

INSECT IDENT. BEPC. USDA
UNDER FUNDS ALLOTTED BY
SECRETARY OF ARMY
NOVEMBER 1943



SIPHON ABSENT

POSTSPIRACULAR HA.R.
SPIRACULAR
APPARATUS.

4A118

IPHON PRESENT.

PLUS ALL CHARACTERS LISTED BELOW

OMB SCALES
IN SINGLE
ROW

ONLY ONE
TUFT

PECTEN SPINES
-- -- -- FIVE MY SPACES

A COMPLETE RING

ANTENNA

SURFACE
 10

SMOOTH,
ANTENNAL

2.

11

—

Approximately 164 non-anopheline mosquitoes are known definitely to occur in the Philippines. Of all these, only *Aedes aegypti* and *Aedes albopictus* are of importance as vectors of disease. Both species

transmit dengue fever on the island of Luzon, where the disease appears to be confined to the lowlands. Urban yellow fever, transmitted by *A. aegypti*, has never made an appearance in the Philippines.

OBSERVATIONS ON THE BITING HABITS OF *CULICOIDES CREPUSCULARIS* MALLOCH IN WESTERN NEBRASKA, WITH NOTES ON OTHER SPECIES COLLECTED IN LIGHT TRAPS (DIPTERA, HELEIDAE)

LAFÉ R. EDMUNDS AND GEORGE G. KEENER, JR.

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A small blood-sucking gnat, *Culicoides crepuscularis* Malloch, occurs in large numbers in the irrigated North Platte Valley of western Nebraska. In certain localities populations of this heleid cause a great deal of annoyance to humans. The bite produces a sharp pain followed generally by irritation. The swellings or small red weals with intense itching sensation may persist for several days. These gnats, sometimes called "Punkies" or "no-sees-ums," are most annoying to people out of doors in the evening, and, owing to their small size and attraction to light, frequently pass through screens and are troublesome within homes. The bites of these small gnats are often mistaken for those of mosquitoes.

During the summer of 1953, while studies were being made on biting habits of mosquitoes, severe annoyance from *C. crepuscularis* was experienced. The heleids were first noted on May 27; and when the adult populations persisted, more detailed studies were initiated in the vicinity of Mitchell, Nebr. Beginning in July adults were collected, with a chloroform tube, as they attempted to bite exposed surfaces of the legs below the knees. Biting activity was recorded for eight consecutive 15-minute periods (2 hours) following sun-

set on 18 evenings from July 24 to Oct. 1. Air temperatures were recorded during each 15-minute period.

The seasonal averages of biting collections of females for successive 15-minute periods during the two hours following sunset, from July 24 through October 1, 1953, were as follows, in chronological order: 120, 278, 305, 179, 53, 33, 28, 39. Average temperatures during the collections periods varied from 51° to 76° F.

A total of 1,035 adults of *C. crepuscularis* was collected; individual collections ranged in numbers from 9 to 166 per night, with an average of 57.5. Biting activity reached a peak in September; the largest numbers were taken on September 8 and 9. Although a complete seasonal picture was not obtained for *C. crepuscularis* in the Mitchell area, James (1943) found, from light trap studies on Heleidae in northern Colorado, that the population of this species remained fairly constant throughout the season.

C. crepuscularis was not found biting during the bright daylight hours. Biting activity started generally a few minutes preceding sunset, reaching a peak during the second and third 15-minute periods following sunset (15 to 45 minutes). On August 6, 1953, collections of *C. crepus-*

cularis were made from 7 to 12 p.m. Biting activity reached a peak between 30 and 45 minutes following sunset, and the heleids continued to bite in small numbers during the remainder of the period.

Several factors probably influenced the biting activity of *C. crepuscularis*; however, the relative importance of the various factors was not studied. From general observations, light intensity appears to be of major significance; while daily variations in temperature, within the ranges observed, appeared to have little effect in the daily activity.

Culicoides haematopodus Malloch females were collected while biting on several occasions along with *C. crepuscularis* but in smaller numbers. During July 1953, 839 specimens of *Culicoides* were taken in a New Jersey-type light trap

operated in Mitchell, Nebr. *C. crepuscularis* (657 specimens) was the most abundant species collected. Other species taken and their order of abundance were: *Culicoides hieroglyphicus* Malloch (132), *Culicoides palmerae* James (21), *Culicoides stellifer* (Coq.) (14), *Culicoides variipennis* (Coq.) (10), and *C. haematopodus* (5).

Most of the Heleidae were identified through the courtesy of Dr. Willis W. Wirth of the Division of Insect Detection and Identification, Bureau of Entomology and Plant Quarantine, Washington 25, D. C.

Literature Cited

JAMES, MAURICE T. 1943. The genus *Culicoides* in northern Colorado. Pan Pacific Ent. 19(4):148-153.

THE DISCOVERY OF *PARAEDES* (*UDAYA*) *ARGYRURUS* EDWARDS, 1934, IN THAILAND (DIPTERA: CULICIDAE)

DEED C. THURMAN, JR.¹

Edwards (1934) erected the genus *Paraedes* for two species of mosquito found in South India and Assam, which, though very different in ornamentation, possessed the following characters:

Paraedes Edwards, 1934 (pp. 446-447). "Margin of squama quite bare. Membrane of wing with distinct microtrichia.

Pulvilli absent. Anterior pronotal lobes small and well separated. Several posterior pronotal and a few postspiracular bristles present, but no spiracular and no lower mesepimeral. Wing-venation normal; vein-6 extending to well beyond the base of the fork vein-5. Wing-scales normal, not emarginate at tips."

This generic diagnosis led Edwards to the conclusion that the two species under discussion could not be placed in any then known genus of Culicidae. The genotype of *Paraedes* he described as *P. barraudi* from two males and figured the male terminalia (Edwards, 1934). The other species he called *Paraedes* (?) *argyrurus* (Edwards, 1934, pp. 448-449).

Recently, specimens of this second species have been collected by the author

¹ Sanitarian, Division of International Health, United States Public Health Service, assigned as Regional Malaria Control Adviser for Northern Thailand with the U.S.A. Operations Mission to Thailand (USOM) of the Foreign Operations Administration. (After the sudden death of the author on April 18, 1953, this and other papers were completed by Mrs. Ernestine B. Thurman, Senior Assistant Sanitarian (R), Division of International Health, USPHS, assigned as Malaria Control Entomologist, USOM to Thailand, FOA.)

and two Thai assistants. The mosquitoes were resting on a tree in a mountain valley at about 3000 feet above sea level in a shaded jungle area near the Wat (temple) of Doi (mountain) Sutep, Chiangmai Province, Northern Thailand. On January 13, 1953, two females were taken that answer to Edwards' description with only minor variations which are stated farther in the paper. A male collected two days later from the same tree has ornamentation identical to the females and is considered to be conspecific with them. Another female was captured from the area on January 17, 1953, and an additional one taken on February 14, 1953, in a similar mountain valley with denser jungle on an adjacent mountain peak, Doi Chom Cheng, of the Doi Sutep range.

The structures of the terminalia of the one male are quite distinct from those pictured by Edwards for *P. barraudi* and the adult has long palpi, almost as long as the proboscis, compared with Edwards' statement that *P. barraudi* has short palpi in the male. A further distinction is that *P. argyrurus* adults are ornamented with silvery scales in tufts on the pleura and the sides of the abdomen, while *P. barraudi* is described as being without ornamentation.

For these reasons the subgenus *Udaya* is proposed for the species *P. argyrurus* as there have been too few specimens found to attempt to separate these two different species into genera. This subgenus is named in honor of Dr. Udaya Sandhinand, Chief Malaria Control Officer, Northern Thailand, a valued co-worker and loyal friend.

Udaya NEW SUBGENUS

Male and female ornamented with tufts of silvery scales on pleura and sides of abdomen. Male palpus about as long as proboscis. Male terminalia.—Ninth sternite conspicuously enlarged, longer than wide, base rounded, apex with tuft of 7 setae; claspette less than $\frac{1}{2}$ the length of basistyle, simple, terminating in single spine; basistyle without distinct basal or

apical lobe; dististyle not highly modified.

Structures of the male terminalia of *P. barraudi*, according to the description and figure by Edwards (1934, p. 448), differ from *P. argyrurus* by having the basistyle nearly cylindrical, more than twice as long as broad, with a tuft of hairs at the somewhat truncate tip; basal lobe large, inner branch with bluntly rounded tip, outer more pointed, and bearing short bristles at tip; dististyle highly modified, broad, almost as long as basistyle, medio-bulge bearing a finger-like process dorsally.

Three females, one male, and slide of male terminalia are deposited in the collection of the USNM. (Genotype and co-types are in the British Museum of Natural History.)

Paraedes (Udaya) argyrurus Edwards, 1934. Female (quoted from Edwards, 1934, pp. 448-449): "Head: Scales on dorsal surface all broad and flat, mostly black, but with a broad oblique stripe of white on each side and a small white area in front between the eyes, which are not very widely separated; scales on under surface of head yellowish; a few dark upright scales on nape. Upper pair of orbital bristles strong, others weaker but fairly numerous. Proboscis about length of fore femur, slender, recurved, dark. Palpi about $\frac{1}{2}$ length of proboscis, entirely dark. Clypeus of normal shape, dark, bare. Thorax: Integument uniformly reddish-ochreous; mesonotum clothed rather densely with small narrow brown scales, no lighter scales, even above wing-roots or on front margin, two pairs of dorso-central bristles on disc, in addition to several in front of scutellum. Scutellum largely bare, but with a small patch of flat dark brown scales on each lobe. Pleural with four patches of flat silvery-white scales; one (the largest) forming a longitudinal stripe immediately below mesonotal border, one on upper part of mesepimeron, one in middle of sternopleura, and one on lower part of sternopleura immediately above base of midcoxa; *apn* (anterior pronotal lobe) clothed with flat silvery-white scales; *ppn*

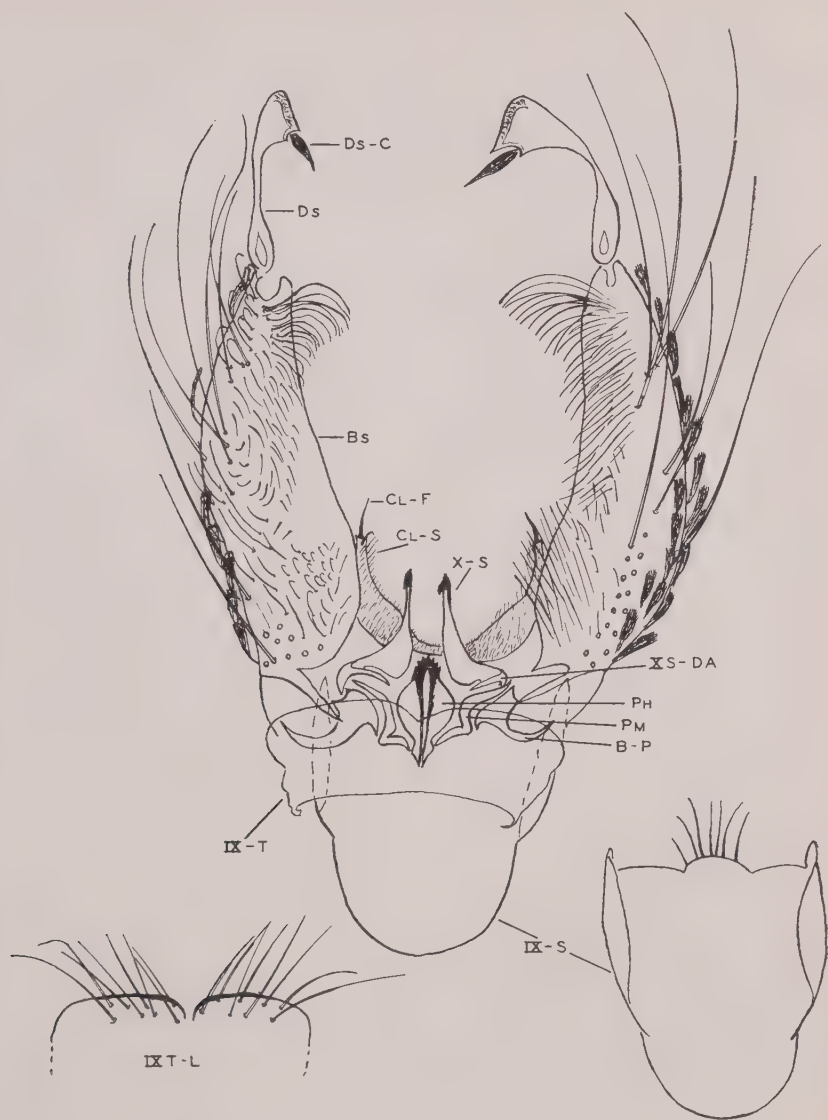


FIG. 1. Structures of male terminalia of *Paraedes (Udaya) argyrurus* Edwards, 1934

B-P	Basal Plate	IX-S	Ninth Sternite
Bs	Basistyle	IX-T	Ninth Tergite
CL-F	Filament of Claspette	IX-T-L	Lobe of Ninth Tergite
CL-S	Stem of Claspette	PH	Phallosome
Ds	Dististyle	PM	Paramere
Ds-C	Claw of Dististyle	X-S	Tenth Sternite
Ib-I	Interbasal Fold	IX-S-DA	Dorsal Arms of Tenth Sternite

(posterior pronotal lobe) devoid of scales, as is also the post spiracular area. About 4-5 posterior pronotal and 3-4 post spiracular bristles; few sternopleural. Wings: dark scaled, scales moderately dense, those in plume series narrow. Venation normal, fork-cells about as long as their stems, bases level. Knob of halteres with black scales at base, silvery at tip. Legs: dark scaled, undersides of femora yellow; hind femora largely yellow, but dark above to base; all femora (but not tibiae) with small white knee-spots; all tarsi with narrow white rings at bases of each of the first three segments, hind tarsi also with a broad white ring on fourth segment, leaving only that tip narrowly black; fifth segment black. Claws simple. Abdomen: dorsal surface mainly dark scaled, with narrow and rather indefinite yellowish bands at bases of tergites II-VII; tergite VIII with a conspicuous patch of silvery scales; tergites I-VII each with a lateral subbasal patch of metallic silvery scales; venter mainly yellow. Cerci small and hidden within segment VIII."

The Thai specimens differ by having a line of silvery scales around the eyes; minute setae on the torus; anterior fork-cell almost twice as long as the stem; bases of anterior fork and posterior fork not quite level; rings completely encircling the tarsal segments on the hind leg only.

Male (new description): Ornamentation and structure similar to female with these exceptions: Palpus almost as long as proboscis, marked with white scales; first segment very short, about the length of clypeus, all dark; second segment long, scattered white scales on upper surface; third segment (the longest one) with a broad ring of white scales covering slightly less than the basal half; remainder of palpus all dark scaled. Proboscis longer than first femur, slightly turned down at apex. Tarsus of fore leg with basal white rings on first two segments (rather than three as in the female). Fore leg with

large claw; mid- and hind leg with small claw. Terminalia.—Basistyle $3\frac{1}{2}$ times as long as wide, tapering to narrow apex; ventral surface clothed with large, flat, closely-set scales; dorsal surface with many short setae in basal patch; setae in thick row along inner edge graduating in length into long setae curving downward from apical patch; laterally numerous long, strong setae and few flat scales. Dististyle about $\frac{1}{2}$ as long as basistyle; slightly expanded at base; narrowed medially; expanded into triangular apex, crowned with irregular striations; terminating in a simple claw, spine-like, bulging medially. Claspette less than $\frac{1}{2}$ length of basistyle; covered with minute setae; bulging basally, tapering to narrow apex; filament short, spine-like; one small subapical spine. Tenth sternite simple; basal arm curving dorsally; apex slender, point retrose. Phallosome closed dorsally; expanded medio-laterally, tapering to base and apex; open ventrally, apex with 5-6 small points. Paramere S-curved, basal curve sharp; apical curve less abrupt, tapering into point. Basal plate broad, two lateral points; long, curved basal arm. Ninth tergite three times wider than long; lobes narrowly separated, each bearing 8 setae directed laterally. Ninth sternite conspicuously developed, longer than wide; base rounded; apex with medial lobe bearing 7 setae.

The author was assisted in the field by Mr. Manop Rattanopradith and Mr. Prayoon, Malaria Control Trainees, Chingmai, Thailand. Their assistance, and also that of Dr. Alan Stone, USNM, and of Dr. Melvin E. Griffith, USOM, FOA, in guiding this and other studies is gratefully acknowledged.

Reference Cited

- EDWARDS, F. W. 1934. Appendix to (pp. 427-453) Barraud, P. J., Fauna of British India. Diptera, Vol. V (Culicidae, Megarhinini and Culicini). Taylor and Francis, Red Lion Court, London, 463 pp.

EDITORIAL SECTION

THE MEETINGS AND THE PROCEEDINGS

After the reorganization of the AMCA and the adoption of the new Constitution and bylaws in 1951 came a period of adjustment and settling. That so few changes have been proposed since their adoption attests to the careful work done by those who framed them and the consideration that was given to the diverse interests and viewpoints represented in the Association. The report of the bylaws committee included in this issue of *Mosquito News* contains recent suggested amendments.

One criticism that we have tried hard to meet, but have heretofore not been too successful in meeting, has been that we have not given enough space to Association business—both “official” business as embodied in the transactions of business meetings and the operation of committees, and “unofficial” as represented in news of more personal interest for and about members and local groups. This has been due largely to the financial outlay that would be necessary to add more pages to carry these additions without sacrificing the space for articles.

Another proposed and admittedly desirable feature that we have been unable to adopt, for the same reason, has been the printing of a year-book to include all of the Proceedings, both business and papers, of the annual meeting, or at least the inclusion of these items in one issue of *Mosquito News*. Progress in the latter direction was made during the past two years, but even the funds set aside from the registration fees of the annual meetings and donated for the purpose to the AMCA by the local host association of the annual meetings were insufficient to meet the costs, except by postponing papers of current interest and timely importance.

Consequently, when the Directors and other officers and committees of the AMCA met with the local committee and

officers of the New Jersey Mosquito Extermination Association to formulate plans for the Atlantic City meeting in April of 1954, the points mentioned above became an important part of the discussion.

The plan which was evolved was essentially this: All papers would be presented before the two Associations meeting jointly, and there would be no separate paper reading sessions of either group alone. Further, the New Jersey Association extended to the AMCA the courtesy and privilege of having all the papers published in their annual volume of *Proceedings*, which has been a distinguished contribution of the New Jersey Mosquito Extermination Association for many years.

The registration fees were to be used to help defray the additional expense and to implement the sending of a copy of the *Proceedings* to each member of the AMCA.

The Editor of *Mosquito News* was first consulted in order to make certain that the proposed procedure would not result in reducing the size or quality of *Mosquito News*. It happened that *Mosquito News* already had on hand manuscripts for two issues ahead in addition to the one then in press. Had the *News* been obligated to publish and give priority to Proceedings papers it would have been forced to postpone many papers of immediate interest, and would not have been able to accept current manuscripts for early publication.

The editor therefore felt that the publication policy that had been proposed, as outlined above, would be of greatest service to the greatest number, and was especially desirable because we can now continue to solicit and accept current contributions with the expectation of early publication. The New Jersey *Proceedings*

should be in our hands by the time the September number of *Mosquito News* appears, probably before, which means earlier publication for most Proceedings papers than would otherwise be possible.

Unfortunately, before these arrangements were announced, a number of papers which had to be cleared through committees or other agencies of the organizations with which the authors were officially connected, had already been given clearance specifically for *Mosquito News*, and this clearance could not be changed without undue hardship and delay. Such papers will appear in *Mosquito News*.

There were one or two authors who disapproved of the arrangement for one reason or another, perhaps largely through misunderstanding of the details or because it was felt that a precedent was being established which might not be so easily followed in the future.

It should be pointed out, therefore, that the procedure described does not neces-

sarily establish a precedent which other host Associations would feel obliged to follow, for it is recognized by all that there are only one or two other Mosquito Control Associations in the entire country that have a sufficiently large membership to afford such an arrangement, or whose Proceedings are printed and enjoy a sufficiently wide circulation to make joint publication of papers desirable.

A further point is that although a *precedent* may not be established, an *example* has certainly been set. If this example could be followed from time to time it would relieve pressure on *Mosquito News*, at least once in several years, and release the space which so many members desire, as in the present issue, for more complete reporting of our business affairs and items of personal interest. This gives the growing list of members a better sense of "belonging" and gives *Mosquito News* greater freedom to publish their current contributions.

A SPECIAL VOTE OF THANKS should be given to Fred Stutz for his excellent reporting of the annual meeting and the assembling of the reports of the various committees. The minutes of the meeting are presented in this issue of *Mosquito News*, beginning on page 89, under Association News. The reports of the committees follow the minutes, identified by the attachment number headings with which they were submitted by Mr. Stutz.

ASSOCIATION NEWS

AMERICAN MOSQUITO CONTROL ASSOCIATION

BUSINESS MEETING

BOARD OF DIRECTORS

2:30 P.M. March 8, 1954

A business meeting of the Board of Directors was held at Haddon Hall Hotel, Atlantic City, New Jersey, March 8, 1954, at 2:30 P.M.

Those present included: F. C. Bishopp, President; R. E. Dorer, Vice President; T. G. Raley, Executive Secretary; L. W. Smith, Treasurer; C. R. Twinn, Past President.

Regional Directors: Donald Mac Creary, Fred Stutz, D. M. Jobbins, C. M. Gjullin, F. C. Wray.

Committee Members and Visitors: J. M. Hirst, S. Peters, Richard Peters, W. E. Bickley, Hellen Sollers, Walter D. Henderson, T. D. Mulhern, A. S. West, Don Collins.

The minutes of the previous meeting in Daytona Beach were distributed. Action on their passage was deferred until members could go over them.

President Bishopp appointed the following Resolutions Committee: Jessie Leslie, A. W. Lindquist, K. L. Knight. They were approved.

President submitted his report. Attachment No. 1.

The Nominating Committee submitted its report for the information of the Board. No action was necessary. Attachment No. 2.

The Secretary requested that he be allowed to make his report before the General Session, which was granted.

The Vice President and Recording Secretary made an oral report in which he suggested that some relief be given the Vice President in regard to his duties as Recording Secretary. Mr. Smith stated that this matter had been considered by the Bylaws Committee and that the Committee would make some recommendation concerning it.

Mr. Smith gave a report of the Treasurer's Office. On motion made by Mr. Smith, seconded and unanimously carried, the report was accepted. Attachment No. 3.

Mr. Smith asked if the official title of the Association included the word "Incorporated." It was brought out that the Articles of Incorporation would settle this point, and it was agreed that a search would be made of the records to answer the question.

Secretary Raley read the auditor's report, which was accepted on motion made by Mr. MacCreary, seconded by Mr. Dorer and unanimously carried. Attachment No. 4.

Treasurer Smith submitted a budget, which was fully discussed. On motion made by Mr. Smith, seconded by Mr. Stutz, and unanimously carried, the budget was approved. Attachment No. 5.

There was considerable discussion on procedure to be followed and price to be charged for back issues of MOSQUITO NEWS. Some present wanted to raise the price. Secretary Raley reported that selected distribution of back issues had promoted good will and was responsible for new accounts. President Bishopp suggested that the matter be left up to the Secretary, Treasurer, and Librarian.

Dr. Bickley read a report of the Miscellaneous Publications Committee, which was accepted on motion made by Mr. Raley, seconded by Mr. Stutz, and unanimously carried. Attachment No. 6.

There was considerable discussion on the publication of Bulletin No. 3. Dr. Twinn moved that approval be given for the publication of Bulletin No. 3 in a number comparable with Bulletins No. 1 and 2 under the most favorable circumstances in keeping with previous bulletins. This was seconded by Jobbins and unanimously carried. Mr. Raley moved that the profit from Bulletin No. 2 be turned over

to pay the cost of publishing Bulletin No. 3. This was seconded by Gjullin and duly carried.

Mr. Smith reported on the Committee on Bylaws in which he recommended changing the Bylaws to provide for an additional officer, namely President Elect; changing the life membership from \$150.00 to \$100.00; and making it the duty of the Treasurer rather than the President to have an audit made by a certified public accountant. Mr. Smith moved the adoption of the report and that the provisions of the report be brought before the General Session for a vote. This was seconded by Mr. Dorer and duly carried.

Dr. Bickley read a report of the Advertising Committee, which on motion made by Mr. Smith, seconded by Mr. Jobbins, was duly accepted. President Bishopp suggested that the report be read at the general meeting. Attachment No. 7.

Mr. Raley gave a report of the Membership Committee, and he moved that in addition to the approval of the report, the Board also approve list of new members for membership. This was seconded by Mr. MacCreary, and duly carried. Attachment No. 8.

The President called for a report of the Public Relations Committee, but there was no report.

Dr. West gave an informal report of the Research Committee, stating that he would be prepared to give a more detailed report at a later Board meeting.

Mr. Dorer gave an oral report of the Program Committee, pointing to the printed program as the accomplishment of that Committee.

Reports were called for from the Committee on Awards, Committee on Good Neighbor Club, and the Arrangements Committee, but as members were not present, they were carried over until later.

An oral report on a Committee to arrange for recording proceedings was made by Mr. Jobbins.

President Bishopp brought up the matter of place for the next meeting. No decision was reached at that time.

Mr. Lester Smith made an informal report for Mr. Powers on the Arrangement Committee.

President Bishopp requested Mr. Peters to present the report of the Committee on Publications. No formal action was taken. However, there was considerable discussion in which Mr. Collins made some important comments.

Don Collins submitted a report on notes, contents, and cost of MOSQUITO NEWS. Attachment No. 9.

The meeting was adjourned to meet again at 9:00 A.M. the following day.

BOARD OF DIRECTORS

SECOND MEETING

9:30 A.M. March 9, 1954

A second meeting of the Board was held at 9:30 A.M. at Haddon Hall Hotel, Atlantic City, New Jersey, on March 9, 1954.

Those present included: F. C. Bishopp, President; R. E. Dorer, Vice President; T. G. Raley, Executive Secretary; L. W. Smith, Treasurer; C. R. Twinn, Past President.

Regional Directors: Fred Stutz, D. M. Jobbins, C. M. Gjullin, F. C. Wray, A. W. A. Brown.

Don Collins—Editor of MOSQUITO NEWS.

Committee Members and Visitors: A. W. Lindquist, R. L. Vannote, Walter D. Henderson, Dr. Paul R. Meyer, Robert L. Armstrong, Alvin Gelhart, Richard F. Peters, C. Donald Grant, T. D. Mulhern, George E. Powers, Charles T. Foulk, II, A. W. Morrill, A. S. West.

A delegation from Jefferson County, Texas, appeared and requested that consideration be given to holding the next or at least a future meeting in Jefferson County, Texas. Dr. Paul R. Meyer and Alvin Gelhart talked. Mr. Mulhern suggested a summer trip to Texas. The Board withheld action for further consideration.

Mr. Powers gave a report on arrangements, in which he noted a tentative income of \$2,230.00 from registrations and exhibitors with expenses of approximately

\$600.00, leaving a profit of an estimated \$1,600.00.

Mr. Peters gave a report of the Publication Committee. His Committee recommended more articles through the News and Notes section on operational projects. Several spoke in favor of this point. Mr. Collins will promote this through the NEWS. The Committee recommended against changing the cover of MOSQUITO NEWS as had been suggested. A secretary's page for the NEWS was recommended. It was suggested that the editor's page include writings of staff members. On motion made by Mr. Peters, duly seconded, the report was approved.

Mr. Foulk reported that he was not too familiar with the workings of the Good Neighbor Club inasmuch as Mr. Stage had always carried out the details and had left no specific instructions. On motion made by Dr. Twinn, seconded by Mr. Raley, it was voted to conduct another 50-50 Club similar to the one conducted in Florida last year with Mr. Foulk in charge.

On motion made by Dr. Twinn, seconded by Mr. Gjullin, and duly carried, the next meeting place was set for Los Angeles, California. The motion also recommended that the 1956 meeting be held in Jefferson County, Texas, provided suitable arrangements were made.

Mr. Vannote mentioned an invitation to a summer meeting at Toledo which was not acted upon. Dr. Bishopp brought up the matter of a meeting every other year. There was no report from the Committee set up for this purpose.

Mr. Jobbins reported on plans for recording of the proceedings for Dr. Pepper, who was not present.

A report of the Special Committee on Awards was made by A. W. Morrill. Mr. Smith moved its adoption, seconded by Mr. Jobbins, and carried. Mr. Morrill then moved that no award be made, which was seconded by Mr. Gjullin and duly carried. Attachment No. 1-A.

Dr. West gave the report of the Committee on Research, in which he recommended a resolution from the Association

against the possible introduction of the mosquito borne virus disease of rabbits, known as myxomatosis. Also recommended for consideration a catalog of membership interests and a cataloguing of location of colonies of arthropods of medical importance. Also suggested was a review of progress on the applied side of mosquito control. Dr. Twinn moved that the report be accepted with recommendation that incoming Board supplement suggestions made. This was seconded by Mr. Jobbins and carried.

The Committee on Legislation was not present. Mr. Wray reported a mixup in law in Illinois. No action taken.

Mr. Raley requested authority for exchange account with Public Health Engineer Abstracts, Public Health Service. On motion made by Mr. Stutz, seconded by Mr. Dorer, this was granted.

The matter of honorary membership of Willard King was brought up to get the reaction of the Board. No formal action was taken.

Dr. Brown gave a report from the Special Committee on changing the name of MOSQUITO NEWS, which showed mixed returns. Dr. Brown moved that the question of changing the name of MOSQUITO NEWS to the Journal of the A.M.C.A. be voted on by the entire membership, the question to be constituted under the direction of the President but not to be binding. This was seconded by Mr. Stutz and duly carried.

The meeting adjourned.

FIRST SESSION
Tuesday, March 9th
2:00-5:00 P.M.

At the first session of the joint meeting of the New Jersey Mosquito Extermination Association and the American Mosquito Control Association, Charles T. Foulk, II, presiding, introduced Dr. F. C. Bishopp, President of the American Mosquito Control Association. Dr. Bishopp described the Amendment to the Bylaws which had been proposed in the report of the Bylaws Committee and which

had been approved by the Board of Directors. On motion made by Harry R. Singer and seconded by William Thom, a vote of the general membership was called for. This was carried by unanimous vote.

The report of the Nominating Committee was read by Dr. Twinn, which did not include nomination for the new positions provided for in the change in Bylaws which had just been passed. Mr. Vannote nominated Mr. Dick Peters for the position of President Elect and Fred Stutz for Vice President. Dr. Twinn nominated Mr. V. Sam Minnich as Regional Director. Dr. Twinn moved that the nominations be closed, which was seconded by Dr. Bickley and carried.

Dr. Bishopp announced the Resolutions Committee, consisting of Mr. Leslie as Chairman, and Mr. Knight and Mr. Lindquist.

FOURTH SESSION Minutes of Meeting

A meeting of the membership of the American Mosquito Control Association was held at Haddon Hall Hotel, Atlantic City, New Jersey, on March 10th, 1954, at 2:30 P.M.

The meeting was called to order by President Bishopp for the business of electing new officers. Attachment #2.

Dr. C. R. Twinn, Chairman, moved the adoption, seconded by Francis P. Creadon. Motion carried.

There being no other immediate business of the Association, the President adjourned the meeting.

SIXTH SESSION Minutes of Meeting

The regular annual business meeting of the American Mosquito Control Association was held at Haddon Hall Hotel, Atlantic City, New Jersey, on March 11th, 1954, at 4:15 P.M.

The meeting was called to order by Dr. F. C. Bishopp, President.

The first order of business was the in-

stallation of the new officers. Robert L. Vannote escorted the new President, R. E. Dorer, and Dr. C. R. Twinn escorted the new Vice President, Fred H. Stutz, to the platform. R. F. Peters, the new President-elect, was absent and was installed in absentia.

Dr. Bishopp turned the gavel over to President Dorer, who addressed the approximately sixty members present. President Dorer then turned the podium over to the Executive Secretary, T. G. Raley, who spoke on several matters pertinent to the welfare of the Association, especially explaining bylaw requirements on nominations and elections.

Secretary Raley reported the receipt of a petition requesting that Dr. W. V. King (retired) be elected to honorary membership. It was moved by Secretary Raley and seconded by C. T. Williamson that Dr. King be elected to honorary membership. Motion carried.

Secretary Raley reported informally on the business of the Association, covering such subjects as publications, the healthy financial condition of the Association, the institution of a budget for the new year, the necessity of increasing the price of single back issues of Mosquito News to \$1.75, and that there would be no increase in membership dues.

Thomas D. Mulhern moved that Lester Smith, Treasurer, be complimented for his excellent work as Treasurer. Motion seconded by Dr. W. E. Bickley, and carried.

Mr. Williamson gave report on Bulletin #1 and #2. The supply of Bulletin #1 is about exhausted. He stated that 1,100 copies of Bulletin #2 are still available. Secretary Raley advised the membership that Bulletin #3 is about ready for publication. It will be priced at about \$2.00 per copy.

Dr. Bickley, Advertising Manager of Mosquito News, spoke on advertising, thanked those who helped, and reported that the income from advertisements last year produced about \$2,000.00. It was moved by Dr. Bickley, seconded by Secretary Raley, that Robert L. Vannote be

complimented on the fine work he did as Advertising Manager. Motion carried.

Porter B. Brockway, a member of the Legislative Committee, spoke on the Miller Bill. Secretary Raley spoke on Senate Bill #2424, also known as the McCarthy Bill, which pertains to the disposal of surplus government property. J. A. Mulrennan spoke on provisions in the bill and said it was bogged down because too many agencies and organizations are fighting to be included as recipients.

Dr. Bishopp spoke on changes in the organization of the Department of Agriculture.

Secretary Raley spoke on the conservation of water and the tax benefit therefrom.

In speaking of MOSQUITO NEWS, the Executive Secretary stated that approximately 1,172 copies were needed, 712 for membership, 25 for Good Neighbors, 6 Honorary, and about 320 that went to subscribers other than members. He further stated that all but about 73 had paid their dues, which he thought was a good figure.

Dr. L. J. Charles stated that Dr. George Gigliolo had been receiving MOSQUITO NEWS through the Good Neighbor Club, and wanted to thank the Association.

Russell Gies spoke of meeting Dr. L. Vargas in Mexico City and stated that Dr. Vargas has a list of one hundred workers in Mexico who perhaps would be interested in joining the Association. He requested applications be gotten to these men. No action was taken.

President Dorer called for report of the Resolutions Committee. Dr. Kenneth Knight read the resolutions. It was moved by Mr. Vannote, seconded by Dr. A. S. West, that the resolutions be adopted. Motion carried. Attachment #10.

President Dorer reported that in an endeavor to get the true feeling of the membership in the matter of changing the name of MOSQUITO NEWS, the Board of Directors had taken action to poll each member. Dr. Bickley moved to deplore and rescind the action of the Board of Directors in putting to a vote the question

of changing the name of MOSQUITO NEWS, which was seconded by Mr. Mulhern. Dr. Bickley spoke on his motion. Dr. A. W. A. Brown, Helen Sollers, Thomas D. Mulhern, and Harry D. Pratt also spoke on this motion. The motion carried—41 for, 9 against.

President Dorer announced that the next meeting would be held in Los Angeles, California, January 24th to 27th, inclusive, 1955. He also spoke of the strong invitation from members from Jefferson County, Texas, for the 1955 meeting and stated that the Board is considering this invitation for the 1956 meeting. He stated that he hoped a stopover visit to Jefferson County could be made by members enroute to California next January. He also reported an invitation from Cleveland, Ohio, for a 1954 summer meeting.

President Dorer gave credit to the New Jersey Association members for their excellent work on the programs and arrangements for the fine meeting.

Dr. Bishopp thanked one and all, especially Dr. Jobbins for his work on recording the meetings. He stated that some committees did not function too well, and in closing asked that all respond fully when asked to work on committees.

President Dorer asked that Resolution #1 be amended to more fully thank local committees for their work on the recordings and to commend Mr. Reck for his splendid work and also for his work in getting out information. Mr. Vannote made motion to amend resolution, seconded by Dr. West. Carried.

There being no further business to come before the Association, the meeting was adjourned.

BOARD OF DIRECTORS Minutes of Meeting

A meeting of the Board of Directors of the American Mosquito Control Association was held at Haddon Hall Hotel, Atlantic City, New Jersey, on March 11th, 1954, at 9:30 P.M.

The meeting was called to order by President R. E. Dorer, the following members being present: Richard F. Peters, President-elect; Fred H. Stutz, Vice President; T. G. Raley, Executive Secretary; V. Sam Minnich, Regional Director; Dr. A. W. A. Brown, Regional Director; C. M. Gjullin, Regional Director; Dr. D. M. Jobbins, Regional Director; Dr. F. C. Bishopp, Immediate Past President; Dr. C. R. Twinn, Past President.

President Dorer discussed his plans for mapping out duties of each constituted committee.

Dr. Bishopp moved approval of the minutes of the previous annual meeting, as presented and distributed to the membership in mimeographed form at the beginning of the general meeting. Mr. Minnich seconded. Motion carried.

Dr. Twinn moved that the following be elected to the Nominating Committee for the coming year:

Dr. F. C. Bishopp, Chairman, Southwest (Gulf) Region; George Powers, Northeast Region; Helen Louise Trembley, Central-East Region; Dr. W. C. McDuffie, Southeast Region; Franklin C. Wray, North-Central Region; Leslie D. Beadle, Rocky Mountain Region; Gaines W. Eddy, Pacific Northwest Region; Harold F. Gray, Pacific Southwest Region; Dr. H. P. S. Gillette, Mexico, Central and South America, West Indies Regions; Dr. B. Hocking, Canada.

Motion seconded by Mr. Gjullin. Carried.

Mr. Raley moved that the following be elected to the Finance Committee: Lester Smith, Chairman; Dr. Don M. Rees, V. Sam Minnich, Dr. C. R. Twinn.

Motion seconded by Dr. Bishopp, and carried.

It was moved by Mr. Peters that the following be appointed to the Good Neighbors Club Committee: Charles T. Foulk, Chairman; Helen Louise Trembley, Harry H. Stage, Helen Sollers, Dr. D. M. Jobbins.

Motion seconded by Dr. Brown. Carried.

Dr. Bishopp moved that the appoint-

ment of Robert L. Vannote as National Advisor be approved. Seconded by Dr. Brown, and carried.

It was moved by Dr. Twinn and seconded by Mr. Peters that Dr. D. L. Collins be reappointed Editor of MOSQUITO NEWS; further, that he be highly complimented by the President for his excellent work on MOSQUITO NEWS; further, that his capable assistant be advised of our appreciation of her work; and further, that a letter be sent to Dr. Collins' superior advising him of the fine and valuable work done by Dr. Collins for the Association in editing MOSQUITO NEWS. Motion carried.

Mr. Raley opened a discussion on the matter of the Association defraying a part of the expenses of officers and others in attending annual meetings of the Association when the meetings are held across the country from the places of employment of the officers. Dr. Twinn moved that this matter be referred to the Finance Committee. Motion seconded by Mr. Peters, and carried.

A discussion was held relative to the distribution of the reports of the proceedings of the joint meetings. Some members felt that since those in attendance had paid for their copies through the payment of the \$4.00 registration fee, those not in attendance should be charged for copies. Dr. Jobbins brought out the fact that there were several cost items that could not be determined until later, and that these items were very pertinent to any decision made at this time. A tentative program of arrangements covering this matter was sent to the members of the Board of Directors after a meeting in September 1953 between representatives of both associations. The membership of the Board agreed to the arrangement. It was moved by Dr. Twinn that the matter of the distribution of the reports of the proceedings of the joint meetings be referred to the Finance Committee for recommendations to the Board of Directors. Seconded by Dr. Jobbins. Motion did not carry. Dr. Brown moved that the original decision, reached by a mail vote, be adhered to and that each member receive a copy of the

report of the joint proceedings. Motion seconded by Dr. Bishopp, and carried.

Dr. Brown moved adjournment. Mr. Gjullin seconded. Motion carried.

Meeting adjourned at 11:30 P.M.

ATTACHMENT #1

REPORT OF THE PRESIDENT OF THE AMERICAN MOSQUITO CONTROL ASSOCIATION Atlantic City March 8th, 1954

It seems appropriate for me to present a brief review of association activities, particularly those with which I have been directly concerned.

I'm sure you have pleasant memories of the splendid meeting of the American Association in Daytona Beach, April 12-17, when Dr. Twinn completed his highly successful term as president and the Association honored me with that office and elected Rowland Dorer as our working vice-president. Rowland has done a top job during the year as he did as treasurer of the Association. His work during the year culminated in arranging, in cooperation with Bailey Pepper, the excellent program for the present meeting. At the Florida meeting Ted Raley got under full steam as executive-secretary of the Association and has been going forward with open throttle throughout the year.

Soon after the Daytona Beach meeting, committees were set up under several chairmen designated and approved at that meeting. These committees have worked well for the most part and I trust that we will have their several reports presented at this session.

It will be recalled that an enthusiastic group from Galveston, Texas, attended the Daytona Beach meeting and made an urgent plea for the Association to meet in Galveston in the near future. Arrangements to hold the 1954 meeting here in Atlantic City in conjunction with the New Jersey Mosquito Extermination Association had progressed so far that a change of that meeting was hardly possible, but consideration was given to the possibility of holding the 1955 meeting there. It was promised, however, that an effort would

be made to arrange a summer meeting in Galveston or at least to have members of the Association visit Galveston and attempt to aid the Texas Gulf Counties in organizing for mosquito control.

I had considerable correspondence with those interested in promoting mosquito control in Texas and on July 29 took part in a meeting in the Buccaneer Hotel in Galveston, attended by county and city officials, citizens of Galveston County and representatives of some of the adjacent counties. A free discussion took place of mosquito problems and needs as well as difficulties in financing antimosquito work. A Galveston County Mosquito Control Association was then organized and Dr. Carl Nau was elected president.

Following the meeting Mr. Cox, who has been supervising mosquito work on Galveston Island, toured the area to give me an idea of the several mosquito problems existing there. On September 17 I made a short visit to the area and discussed plans to get further organizational work underway.

During the winter following the filing of a petition, an election was held in accordance with the state law to establish a mosquito control district in Galveston County. This was carried by a comfortable margin, but still the problem of financing the project was not solved.

President Nau, in recent correspondence, has suggested the desirability of a field meeting in April. I have encouraged this plan and Lester Smith has indicated that he, Bob Vannote and Vernon Conant might be able to attend if it does not conflict with the Florida Association Meeting to be held in April.

Harry Stage represented the AMCA at the Fifth International Congresses of Tropical Medicine and Malaria which was held in Istanbul, Turkey, August 28 to September 4. He was also an official U. S. delegate representing the U. S. Department of Agriculture.

Mr. Stage resigned from the Bureau of Entomology and Plant Quarantine in October 1953 to take a position in Indo China with the F.O.A. and arranged for

Bill Bickley to take over as advertising manager of Mosquito News. This caused the job of Associate Editor of the News and Notes to be shifted. Austin Morrill agreed to undertake that work.

The untimely death of Lyell Clarke left the directorship in the North Central Region vacant. An interim appointment of F. C. Wray was made to this position.

A. W. Lindquist was brought to Washington about July 1 to fill the position of Chief of the Division of Insects Affecting Man and Animals made vacant by the elevation of E. F. Knippling to Assistant Chief of the Bureau of Entomology and Plant Quarantine. This position in turn was vacated by my resignation to assume a position with the Oscar Johnston Cotton Foundation.

C. M. Gjullin was appointed Regional Director of the Pacific Northwest area when Dr. Lindquist moved East.

During the year I have traveled over much of the United States and have attempted to promote the interests of the Association whenever opportunity offered. I attended the meetings of the Western Branch of the Entomological Society of America at Lake Tahoe, California, June 22-25, the Cotton States Branch in Biloxi, Miss., January 25-27, the Southwestern Branch in Dallas, Texas, Feb. 1-3, and the annual meeting of the parent Association in Los Angeles, Calif., December 7-10.

Unfortunately I was unable to attend the meeting of the Utah Mosquito Abatement Association or that of the Virginia Mosquito Control Association but I did attend the 22nd annual meeting of the California Mosquito Control Association in Berkeley, Calif., December 1-3. This was an excellent meeting with a well rounded program.

Opportunity was taken by officers of the Association present to discuss some of the work of the organization and plans for the meeting here in Atlantic City.

One of my regrets is that the publication of Bulletin No. 3 of the AMCA has not been realized during the year. A number of problems have been encountered in connection with this project. Miss

Trembley has worked hard under several handicaps to put the manuscript into final form and the prospects for getting this useful publication out this year are good.

(Signed) FRED C. BISHOPP

ATTACHMENT #1-A RECOMMENDATION OF THE SPECIAL COMMITTEE ON AWARDS

Mr. President and members of the Association:

Having in mind the need of this Association for even closer unity among the membership rather than distinctions which might be both invidious and divisive, and after careful consideration also of the difficulties which would attend the selection, in an Association of this sort, of one person whose work might be acclaimed the most outstanding, the Committee recommends that no such award, annual or otherwise, be made at this time.

In lieu of making such an award, it is recommended that it be stated by the President to be the duty of each of the Regional Directors to send in, each year, for publication in the Association's journal, Mosquito News, a short narrative description of a piece of work done by a member from his region which the Director adjudges to be both creative and of general interest as making a significant advance in a technique of the study and control of mosquitoes.

Should it nevertheless be the decision of the President and the Membership that an award be made at this time, it is recommended:

That the President choose five members to constitute a Committee on Awards,

That these members be chosen to represent ecology, taxonomy, morphology, toxicology and applied control,

That two of the five be appointed for two years, two for three and one for four, in order that continuity may be assured, and

That the Committee be instructed to choose a person from among the membership who shall be given an award and

designated as *one* of the Association's outstanding members, the award being based, not upon any one portion or chronological period of his work, but upon his whole contribution to his field of mosquito control.

Respectfully submitted, J. D. DeCoursey,
R. B. Eads, H. H. Stage, Helen Louise
Trembley, Austin W. Morrill, Jr., Chm.

(Signed) Austin W. Morrill, Jr.

ATTACHMENT #2

REPORT OF THE NOMINATING COMMITTEE OF THE AMERICAN MOSQUITO CONTROL ASSOCIATION FOR 1954*

Office	Name	Term
President	Mr. R. E. Dorer	1 year
Vice-President	Mr. R. F. Peters	1 year
Regional Directors:		
S.E. Region	Mr. Fred H. Stutz	2 years
S.W. (Gulf)	Dr. Carl A. Nau	2 years
N. Central	Mr. Otto McFeely	1 year †
Pacific N.W.	Mr. C. M. Gjullin	2 years
Rocky Mountain	Dr. Don M. Rees	2 years
Mexico, Central and South America and West Indies	Dr. Luis Vargas	2 years

† To complete the remaining year of the 2-year term of the late Mr. J. Lyell Clarke.

The Nominating Committee for 1954 was appointed by the President and Board of Directors at the Daytona Beach Meeting on April 15, 1953, and is representative of all 10 regions recognized by the Association, as follows:

North-east Region, Mr. R. W. Gies; Central-east Region, Dr. W. E. Bickley; South-east Region, Dr. M. W. Provost; North-central Region, Mr. Otto McFeely; South-west (Gulf) Region, Mr. H. W. VanHovenberg; Rocky Mountain Region, Mr. T. A. Schoenfeld; Pacific North West, Mr. A. R. Roth; Pacific South West, Mr.

T. D. Mulhern; Mexico, Central and South America and West Indies, Dr. Luis Vargas; Canada, Dr. C. R. Twinn (Chairman).

To ensure a completely democratic procedure each member of the Nominating Committee was requested by the Chairman, to nominate one member of the Association for each office. The results of this canvass were then tabulated and distributed to the committee, who were requested to submit a second ballot naming for each office some one who was nominated for that office in the first ballot.

It was agreed that the members receiving the highest number of nomina-

tions for each office in the second ballot should be presented as the unanimous choice of the Nominating Committee. The results of this second ballot were tabulated and distributed to the committee, together with a statement of the names of the members nominated for the various offices. All the nominees have agreed to stand for election.

The following elected officers of the Association have one more year to serve, to complete their present terms of office: Secretary, Mr. T. G. Raley; Treasurer, Mr. L. W. Smith; Regional Directors: Canada, Dr. A. W. A. Brown; North East Region, Mr. D. M. Jobbins; Central East, Mr. D. MacCreary; Pacific South West, Mr. G. E. Washburn. The retiring President of the Association, Dr. F. C. Bishopp, and his immediate predecessor, Dr. C. R. Twinn, will continue to serve

* For presentation at the Annual Meeting of the Association to be held at Atlantic City, March 8-12, 1954. The Bylaws require that the report shall be presented on the morning of the first day of the convention, and voted on the second day.

on the Board of Directors for two years and one year, respectively.

(Signed) C. R. TWINN

Chairman, Nominating Committee
American Mosquito Control Association
Ottawa, Canada
January 15, 1954

ATTACHMENT #3

TREASURER'S REPORT FOR THE PERIOD
JUNE 5TH, 1953, TO FEBRUARY 1ST, 1954

See March, 1954 number of Mosquito News (Vol. 14, No. 1, p. 38).

ATTACHMENT #4

AUDITOR'S REPORT
REPORT UPON EXAMINATION
TREASURER'S ACCOUNT

JUNE 5, 1953

TO

JANUARY 31, 1954

NATHAN LIPMAN

CERTIFIED PUBLIC ACCOUNTANT

280 Hobart Street
Perth Amboy, N. J.

March 1, 1954

American Mosquito Control Association,
Inc.

Parsonage Road

Metuchen, New Jersey

Gentlemen:

We have examined the records of Mr. Lester W. Smith, Metuchen, New Jersey, Treasurer of American Mosquito Control Association for the period from June 5, 1953 to January 31, 1954, and have prepared, without audit verification, the attached summary of his recorded cash receipts and disbursements.

Pursuant to engagement the examina-

tion was limited in its scope, the extent of which is set forth herewith.

All recorded receipts were found to have been properly deposited in bank. All cancelled checks drawn by the Treasurer were inspected by us, and were compared with entries appearing in his cash disbursements journal. Such disbursements were supported by vendors' invoices. Cash on deposit, at January 31, 1954, was reconciled with the statement supplied by the bank, and was confirmed to us by letter from the institution.

The scope of our examination did not include verification of members' accounts for dues charged, collected, or unpaid during the above mentioned period; nor did it include confirmation of other revenues which accrued to the Association during the period under review. The Treasurer informed us that the following amounts were due to the Association as at January 31, 1954:

1953 dues	\$330.00	
1953 subscriptions	65.00	\$395.00

Also, he stated that the above stated items together with cash on deposit at the close of the period in the amount of \$1,263.09, constituted all of the assets of the Association in his custody at January 31, 1954. Three unpaid bills made available for our inspection as of the above-mentioned date totalled \$37.34. One of these for \$18.75 covers the Treasurer's bond.

The Minutes of the Association were unavailable for review.

Invoices inspected by us indicate that the following described fidelity bonds should be in force. These bonds were not available for our inspection.

Person Covered	Date of Policy	Insurer	Policy No.	Amount of Bond
(1) Theodore G. Raley	1-5-53	Hartford	2703711	\$2,000.00
(2) Lester W. Smith, Treasurer	1-21-54	Travellers	428211	3,000.00

(1) Premium \$5.00 Term—not stated on invoice

(2) Premium \$18.75 Term—3 years

Respectfully submitted,

(Signed) NATHAN LIPMAN

ATTACHMENT #5

BUDGET ESTIMATE 1954

SECRETARY:

Postage	\$ 75.00	
Printing, Stationery and Forms	115.00	
Telephone, Telegrams	25.00	
Other Expense	10.00	
Travel Expense, Annual Meetings	375.00	\$ 600.00

TREASURER:

Postage	100.00	
Printing, Stationery and Forms	75.00	
Telephone, Telegrams	25.00	
Bonds, Fiduciary Officers	15.00	215.00

EDITOR:

Postage	25.00	
Printing, Stationery and Forms	25.00	
Telephone, Telegrams	25.00	
Printing, Addressing, Mailing		
Mosquito News and Reprints		
Four issues	5,900.00	5,975.00

ADVERTISING MANAGER:

Postage	50.00	
Printing, Stationery and Forms	25.00	
Telephone, Telegrams	25.00	
Other Expense	10.00	110.00

LIBRARIAN:

Postage	50.00	
Printing, Stationery and Forms	25.00	75.00

TOTAL BUDGET: \$6,975.00

ESTIMATED REVENUE, 1954

Dues and Subscriptions—1,000 members at \$5.00	\$5,000.00
Advertising \$500.00 per issue	2,000.00
Reprints 125.00 per issue	500.00
Sale of Bulletins and Back Issues	300.00
Contributions	
TOTAL	\$7,800.00

ATTACHMENT #6

REPORT OF THE STANDING COMMITTEE ON MISCELLANEOUS PUBLICATIONS, TO THE BOARD OF DIRECTORS, AMERICAN MOSQUITO CONTROL ASSOCIATION, INCORPORATED

Your committee has reviewed the manuscript of the proposed bulletin No. 3, *Mosquito Culture Techniques and Experimental Procedures*, and all suggested

changes have been incorporated in the typescript which will be ready for release to the printer within the next month.

Your committee unanimously recommends immediate publication. The committee urges the Board to authorize the printing of 600 copies. It is of the opinion that publication of this bulletin is a sound financial venture. The committee asks that the Board take appropriate action to finance publication through the use of

proceeds from previous bulletins, money received by the Good Neighbor Club (about \$400.00 of which is earmarked for purchases of Bulletin No. 3), and other available funds. It feels that dues should not have to be used to subsidize publication costs.

Respectfully submitted
(Signed) WM. E. BICKLEY
Acting Chairman

Members:

B. V. Travis, Chairman
W. H. W. Komp
H. H. Stage
J. M. Hirst
B. Hocking
W. D. Reed

ATTACHMENT #7

Department of Entomology
University of Maryland
College Park, Maryland
March 5, 1954.

To the Board of Directors, A.M.C.A.,
Members of the Committee on Sale of Advertising Space, Mosquito News, and the Committee on Publication of Mosquito News:

Gentlemen:

The attached report is that of the Advertising Manager and not really the report of a committee chairman. Of necessity handling the advertising is a one-man job to a great extent. Members of the Committee have been most cooperative when called upon to contact prospective advertisers and for other help.

The work was carried on by Mr. R. L. Vannote for so many years that he deserves the lasting gratitude of the Association for assuming the burden and for the excellent job performed. Mr. Harry Stage with his characteristic energy and enthusiasm increased the number of advertisements during the short time he was at the helm.

Your present Chairman hopes to turn back the work to Mr. Stage in 1955, but if that is not possible he will turn it over to a successor whom he feels the Board is obliged to select in 1955.

Because our publication has such a limited appeal to advertisers due to its specialized nature, we must depend almost entirely on personal contacts in securing new advertisers and in holding old ones. The following concerns appear to be good prospects: Spraying Systems, Willys Jeep, Ellicott Machine Company, and American Cyanamid (malathion). The help of any Association member in securing ads from these companies or any others will be appreciated.

Sincerely yours,
(Signed) Wm. E. Bickley
Advertising Manager

REPORT OF ADVERTISING MANAGER OF
MOSQUITO NEWS JANUARY 1 TO
DECEMBER 31, 1953

The figures below* cover receipts during the calendar year 1953 for advertising in the December, 1952 number and the March, June, and September numbers of 1953. (Vol. 12, No. 4 and Vol. 13, Nos. 1, 2, and 3.)

Number of pages of advertising (this does not include space devoted to Mosquito News and Association Bulletins): 57¼

Advertising rates were raised effective January 1, 1953, but when contracts were signed prior to that date the old rates applied. During the calendar year 1954 the new rates will apply to all accounts. Agencies are allowed 15% commission.

It is difficult to arrive at an estimate of receipts for the calendar year 1954, but this figure will probably exceed \$2,000.00.

Expenses of your advertising manager incurred from October 16 to December 31, 1953, amounted to \$25.00 for postage.

* Amount received, January 1 to October 15, 1953	\$1,538.11
Amount received, October 15 to December 31, 1953	529.12
Total	\$2,067.23
Unpaid accounts 2, amount	\$ 150.00

During the year 1954 requests for operating funds are as follows:

Printing (already paid for)	\$43.75
Postage and telegrams	35.00
Honorarium for stenographer	
for services in 1953	5.00
for services in 1954	10.00
	—
Total	\$93.75

No changes in bookkeeping practices are anticipated. However, an examination by a representative of the Board of Directors of methods employed would be welcomed by the Advertising Manager.

Respectfully submitted,

(Signed) Wm. E. Bickley

ATTACHMENT #8

AMERICAN MOSQUITO CONTROL ASSOCIATION, INC.

Membership Committee Report 1953

T. G. Raley, Chairman

Membership in the American Mosquito Control Association during 1953 was probably not the highest on record but, it came so very close each member can be proud of the Association progress. A bill from Boyd's Printing Company for the June issue of 1952 shows that Mosquito News was mailed to 1,089 addresses. The bill for December 1953 lists 1038 addresses. At first glance this would indicate a decline in interest but when the drastic readjustments made by Mr. Dorer in 1952 are taken into consideration the recovery has been remarkable. Several of the 1038 addresses receive more than one copy so actually this is not a complete figure. A rough count of these multiple mailings will add about 45 to the number receiving Mosquito News.

Probably the most encouraging note in this readjustment period has little to do with figures as such. Whether the Association has 900, 1100 or even 1500 members means little unless each has an active interest in the affairs of the group. During the year and a half that I have been involved with the membership list

I have been impressed with the healthy growth that has occurred. At least half of the new accounts have been stimulated by the quality of Mosquito News and were completely voluntary. Most of the others were sponsored by members who are not on the Membership Committee. (As Chairman I will claim a few for the Committee but really don't mind being last.) To the best of my knowledge all of the sponsored members joined at their request, too. They will all be members for many years to come.

Classes of membership and subscribers now receiving Mosquito News are rather hard to break down into figures now that the one price is paid by all. From records available in the Executive Secretary's office the following is a reasonable indication:

Active Members	712
Honorary Members	6
Good Neighbor Club Members	25
Mosquito News Subscriptions	273
Orange County MAD	16
Merced County MAD	8
Alameda County MAD	3
Salt Lake City MAD	7
U. S. Army, San Francisco	9
Four Continent Book Corp.	7
STEM—Thailand	2
	—
	52
Exchange Subscriptions	45
	18
	—
	1,072

A large majority of these paid dues for 1953 or are new for 1954.

Cancellations during 1953 were reasonable. Approximately 30 accounts were dropped by request, 8 were dropped from the Exchange list and 5 deaths were reported. Latest available records show 78 accounts have not paid dues for 1953. A guesstimate is that about 60 of these will be dropped from the mailing list.

Returns from the "Who's Who" form sent out to all members paying dues for 1953 were encouraging. Members completed and sent back 301. The affiliations reported are as follows:

Schools	44
Students	4

Federal	59
State	19
City and County	23
Army	18
Navy	7
Mosquito Dists.	48
Foundations	17
Commercial	58
WIOO	4

A list of new accounts since the Daytona Beach meeting has been sent to all Board Members. Unanimous approval is recommended for all accounts requesting the classification of Active Members. Twenty-four new accounts have been added to the mail list since January 31. There have been nine cancellations.

ATTACHMENT #9

Mosquito News: Notes on Contents and Costs

Table 1. Comparison of figures for 1951, 1952, and 1953

	1951 Vol. 11	1952 Vol. 12	1953 Vol. 13
No. of pages (total)	272	312	336
No. of pages of articles (incl. Proc.)	168	212	192
Total No. Proceedings pages	89	99	97
Total No. articles (incl. Proc.)	40	53	54
" " Proceedings articles	24	24	24
No. Articles pages per issue (incl. Proc.)	42	53	48 (Av.)
Av. No. articles per issue (incl. Proc.)	10	13	13 1/2

Costs	1951 Vol. 11	1952 Vol. 12	1953 Vol. 13
No. copies printed	4,550	4,600	4,600
Total cost (total of Boyd's bills)	\$4,900.85	\$5,890.98	\$6,699.59
Ave. cost per issue	1,225.21	1,472.75	1,674.90
Av. cost per copy	1.08	1.29	1.46
Av. cost per page	18.02	18.88	19.94

Figures for 1953

Total cost—\$6,699.59
Cost of postage—\$258.27

Addressograph plate changes and additions
(400) cost \$49.52 (11 cents a plate, then
13 cents per plate)

The increase in costs went into effect with
June 1953 issue; an increase of 15% except
on magazine text and cover stock.

Notes

In 1951 we charged \$1.00 a copy for Mosquito
News
(\$4.00 per year for dues).

The cost was \$1.08 per copy delivered.

In 1952 we charged \$1.00 a copy for Mosquito
News

(dues \$4.00 per year).

The cost was \$1.29 per copy delivered.

In 1953 we charged \$1.25 a copy for Mosquito
News

(dues \$5.00 per year).

The cost was \$1.46 per copy delivered.

The March 1952 and December 1952 issues
had 52 pages each, but the March number
cost \$198.59 more because it had the index,
and other additional fine print or difficult
material, etc.

ATTACHMENT #10

Resolutions

ONE

WHEREAS, The privilege has been extended to the American Mosquito Control Association to meet in joint session with the New Jersey Mosquito Extermination Association in their 41st mosquito control convention, and

WHEREAS, The New Jersey Mosquito Extermination Association has provided excellent accommodations, and assisted in the arrangements of a most instructive and interesting program, therefore

BE IT RESOLVED: That the American Mosquito Control Association express its appreciation to the New Jersey Mosquito Extermination Association for the many courtesies, and the friendly spirit of co-operation extended during these sessions.

Two

WHEREAS, Since our last meeting, God in His infinite wisdom has taken from our midst several of our cherished and respected members, and

WHEREAS, We miss their presence at these meetings and their counsel and interest, therefore

BE IT RESOLVED: That we express our sense of deep sorrow at the passing of these members, and request our Secretary to note the name of each such member in our minutes, and extend condolence in behalf of the Association to the respective families.

THREE

WHEREAS, The research program of the U. S. Public Health Service has contributed significant field and laboratory studies and valuable visual training aids to the field of mosquito control, and

WHEREAS, This program has been drastically curtailed during the past year, and

WHEREAS, The U. S. Department of Agriculture research program on mosquito control as it affects human health and comfort, and agricultural production, has suffered serious curtailment during the past few years, and

WHEREAS, These research programs have contributed so materially to health and comfort throughout the world,

BE IT RESOLVED: That the American Mosquito Control Association go on record as expressing its deep concern over this loss, and further urge that earnest consideration be given to restoring these programs.

Copies to: Secretary, Department of Health, Education and Welfare.

Secretary, Department of Agriculture.

Chairman, Of Appropriate Congressional Committee.

FOUR

WHEREAS, The U. S. Government through the foreign operations administration and the U. S. Public Health Service of the Department of Health, Education and Welfare, has rendered valuable assistance to Malaria Control Program in many underdeveloped countries of the world,

BE IT RESOLVED: That The American Mosquito Control Association express its appreciation for the work already done, and extend its sincere wishes for continued success of the world wide Malaria Control Programs in the future.

Copies to: 1. Director, Foreign Operations Administration, Washington, D. C.

2. Secretary, Department of Health, Education and Welfare, Washington, D. C.

3. Chief, Public Health Division, FOA.

4. Chief, Division of International Health, Dept. of Health, Education and Welfare.

FIVE

WHEREAS, The mosquito borne virus disease of rabbits known as myxomatosis has been very effective in killing rabbits in Australia, and has proven disastrous to

the rabbit raising industry in Europe, and

WHEREAS, The introduction of this mosquito transmitted disease into North America would create in all probability a serious threat to commercial rabbitries,

BE IT RESOLVED: That the American Mosquito Control Association go on record as being opposed to such introduction, and recommend strongly that quarantine measures to prevent possible introduction be established, by the proper authorities.

Submitted by: Special Committee on Research and Development with approval of the Board of Directors, AMCA.

SIX

WHEREAS, The use of insecticides is necessary for the control of mosquitoes and other insect vectors of diseases throughout the world, and has already saved thousands of lives, and gives promise of saving many more thousands of lives, and

WHEREAS, Insecticides are necessary to save food, fiber, and animal crops for an expanding domestic population, and

WHEREAS, The membership of the American Mosquito Control Association is also desirous of protecting mosquito control personnel, live stock and the public from possible ill effects in the use of insecticides, therefore

BE IT RESOLVED: That the American Mosquito Control Association endorse the passage of the Miller Bill (HR 7125), which bill is designed to accomplish these purposes.

Copies to: 1. Members of Inter-state and Foreign Commerce Committee of the U. S. House of Representatives.
2. Executive Secretary, National Chemicals Association.

SEVEN

WHEREAS, The Armed Forces Career Compensation Act which provides incentive pay for physicians, dentists and

veterinarians does not include those personnel comparably qualified by virtue of possession of either the Degree of Doctor of Science or Philosophy, and,

WHEREAS, In view of the increasing importance of the field of Medical Entomology and the requirement for personnel fully qualified to program and develop procedures and techniques for the control of noxious arthropods, and

WHEREAS, It is the opinion of this Association that preventive medicine is of equal importance to the other divisions of medicine, and

WHEREAS, It is the desire of this Association that those personnel possessing either the Degree of Doctor of Science or Philosophy in a field of science related to medicine and acceptable to the Office of the Surgeon General be granted comparable recognition in said Armed Forces Career Compensation Act, therefore

BE IT RESOLVED, That the American Mosquito Control Association go on record as being in full support of the intent of this resolution and that the executive Secretary of the Association be instructed to inform the American Association for the Advancement of Science of its action through an official letter.

EIGHT

WHEREAS, Dr. Fred C. Bishopp has now retired from the Bureau of Entomology and Plant Quarantine of the U. S. Department of Agriculture, and

WHEREAS, Dr. Bishopp during his many years of active service has been most instrumental in the advancement of mosquito control and has endeared himself to the other members of this association who have had the opportunity of working with him, and

WHEREAS, Dr. Bishopp has been a very important person in the American Mosquito Control Association serving diligently on many committee assignments and as President of the Association, therefore

BE IT RESOLVED, That the American Mosquito Control Association express its

sincere appreciation to Dr. Bishopp for his many years of such competent service in our behalf and extend to him our wish that his retirement may ease some of the

tension of active duty, but not keep him from continuing to be active in mosquito control where his advice and experience are so necessary and valued.

—AMENDMENTS TO BYLAWS—

ARTICLE VI. POWERS AND DUTIES OF OFFICERS

Section 1. President. The President of the Association shall be Chairman of the Board of Directors, and shall have the usual responsibilities and powers of supervision and management such as pertain to his office, and such other powers as are specified in the Bylaws or properly assigned from time to time by the Board of Directors. He shall have the following specific powers.

A. To preside at all meetings of the Association and inform *Mosquito News* of the action of the Board of Directors.

Section 2. Vice-President. The Vice President shall assist the President and President-elect in any work they may delegate to him. In case of the President's or President-elect's absence, inability to act, resignation, or death, the Vice-President shall perform the duties of the President and/or the President-elect until his return, or until the next general convention.

The Vice-President shall serve as Recording Secretary at general conventions in addition to his other duties. He shall be responsible for keeping the minutes of the Association when assembled in general convention, and of such other meetings as may be held. He shall be responsible for keeping in order, and for compiling from time to time for information of the membership through publication in *Mosquito News*, any reports of proceedings derived from such meetings.

PROPOSED NEW OFFICE

President-elect.

A. To act in the absence of the President.

B. To assist the President when requested.

C. Shall be Chairman of Program Committee.

D. To announce all his committees when taking office of President.

To be elected (one year term of office).

This office has been suggested by many members of the Association to relieve the Vice-President of some of his many duties.

ARTICLE III. MEMBERSHIP AND DUES

Section 2.

B. Life membership to be reduced from \$150.00 to \$100.00, payment to be made in lump sum.

ARTICLE VI. POWERS AND DUTIES OF OFFICERS

Section 1. President.

F. To engage a Certified Public Accountant to audit the books annually. (To be changed to the duty of the Treasurer.)

G. To submit the accountant's report to the Board of Directors. (To be changed to the duty of the Treasurer.)

H. To suggest for consideration by the Board of Directors, names for the Chairman and members for the standing committees and such special committees as are provided for in the Bylaws or may be approved by the Board. (To be changed to the duty of the President-elect.)

The following suggestions for changes in our Bylaws have some from members of the Association and officers concerned (namely, your Secretary and Treasurer).

We believe the suggested changes will divide more of the work among the elected officers and not overload any particular office. Any suggestions or changes will be appreciated by me.

Sincerely yours,

Lester W. Smith
Chairman

DIRECTORS, OFFICERS AND COMMITTEES FOR 1954

Board of Directors and Officers: See back cover**Regional Directors:** See back cover**Editorial Staff of *Mosquito News*:** See inside front cover

COMMITTEES

Standing Committee on Publication of *Mosquito News*: Richard F. Peters, Chairman, c/o California State Dept. Pub. Health, 2180 Milvia St., Berkeley 4, Calif.; Don M. Rees, University of Utah, Salt Lake City 1, Utah; J. M. Williams, Director of Mosquito Control, Court House Bldg., Sarasota, Fla.; B. I. Gerry, State Reclamation Board, 41 Tremont St., Boston 33, Mass.; L. A. Stearns, 278 Orchard Road, Newark, Del.; A. W. A. Brown, Univ. of Western Ontario, London, Ontario, Canada; Harold Gray, 1A Court House, Oakland 7, Calif.

Standing Committee on Finance: Lester W. Smith, Chairman, Middlesex Co. Mosq. Exterm. Comm., Parsonage Road, Metuchen, N. J.; H. D. Peters, City Health Dept., 940 Main St., Jacksonville, Fla.; Herman Fellton, 15 Peachtree Place, N.W., Atlanta, Ga.; Geo. L. Hutton, Pest Control Section, Bur. of Yards & Docks, Dept. of Navy, Washington 25, D. C.; Frank A. Steinrock, Todd Shipyard Corp., 81-16-45th Ave., Elmhurst, Queens, New York; Ted G. Raley, Box 278, Selma, Calif.; Fred H. Stutz, Dade Co. Anti-Mosq. Dist., 1909 Court House, Miami 32, Fla.; George E. Powers, Union Co. Mosq. Exterm. Comm., 324 North Ave. East, Cranford, N. J.; Otto McFeeley, 200 Forest Ave., Oak Park, Ill.; C. Donald Grant, P. O. Box 629, Turlock, Calif.

Standing Committee on By Laws: Bailey B. Pepper, Chairman, N. J. Agr. Expt. Sta., New Brunswick, N. J.; R. F. Darsie, Jr., University of Delaware, Newark, Del.; Helen Sollers, Bur. Entom. & Pl. Quar., U. S. Dept. of Agr., Washington, D. C.; Ted G. Raley, Box 278, Selma, Calif.; Thomas H. Sperbeck, Sutter Yuba, M.A.D., 925 Market St., Yuba City, Calif.; John A. Mulrennan, State Bd. of Health, Box 210, Jacksonville, Fla.

Standing Committee on Miscellaneous Publications: B. V. Travis, Chairman, Entom. Dept., Cornell Univ., Ithaca, N. Y.; W. H. W. Komp, USPHS, 6906 Dartmouth Ave., College Park, Md.; John M. Hirst, Lt. Cdr., MSC, USN, U. S. Naval Air Station, Alameda, Calif.; B. Hocking, Univ. of Alberta, Edmonton, Alberta, Canada; W. D. Reed, U.S.A. Engineers, 3609 Military Rd., N.W., Washington 15, D. C.; C. T. Williamson, 16 Orowoc Ave., Islip, N. Y.

Standing Committee on Sales of Advertising Space: William E. Bickley, Chairman, Univ. of Maryland, College Park, Md.; Robert L. Vannote, 3 Franklin Place, Morris Plains, N. J.; George E. Powers, Union Co. Mosq. Exterm. Comm., 324 North Ave. East, Cranford, N. J.; Samuel V. Minnich, Box 552, South Daytona Beach, Fla.; E. Chester Robinson, East Side Mosq. Ab. Dist., Box 1023, Modesto, Calif.; Herman Fellton, 15 Peachtree Place, N.W., Atlanta, Ga.; A. W. Lindquist, Bur. Entom. & Plant Quar., U. S. Dept. of Agriculture, Washington 25, D. C.; Franklin C. Wray, 8130 Ogden Ave., Lyons, Ill.; P. B. Brockway, Jr., Toledo Area Sanitation Dist., 5015 Shickney Ave., Toledo, Ohio; Leroy Kinsey, 173 Ferncraft Road, Mincola, Long Island, N. Y.

Standing Committee on Legislation: E. F. Knipling, Chairman, Bur. Entom. & Plant Quar., U. S. Dept. of Agriculture, Washington 25, D. C.; Robert L. Vannote,

3 Franklin Place, Morris Plains, N. J.; John A. Mulrennan, State Bd. of Health, Box 210, Jacksonville, Fla.; C. T. Williamson, 16 Orowoc Ave., Islip, N. Y.; Helen Louise Trembley, National Institutes of Health, Bethesda 14, Md.; William Thom, Middlesex Co. Mosq. Exterm. Comm., Metuchen, N. J.; Chris A. Hanson, PHIS, Com. Disease Center, 50 Seventh St., Atlanta, Ga.

Standing Committee on Membership: T. G. Raley, Chairman, P. O. Box 278, Selma, Calif.; Thomas D. Mulhern, 334 Rowell Bldg., Fresno, Calif.; A. W. Lindquist, Bur. Entom. & Pl. Quar., U. S. Dept. of Agriculture, Washington 25, D. C.; Dr. Arturo Luis Berti, Div. Entomologia, Maracay, Venezuela; Dr. Luis Vargas, Apartado Postal 19205, Mexico, DF; Dr. Stephen M. K. Hu, Bur. of Mosq. Control, Honolulu 1, Hawaii; Dr. H. P. S. Gillette, P. O. Box 556, Port of Spain, Trinidad, B.W.I.; Roy F. Fritz, PHIS, Com. Disease Center, 50 Seventh St., Atlanta, Ga.; Orson W. Young, Weber College, Ogden, Utah; John M. Hirst, Lt. Cdr., MSC, USN, U. S. Naval Air Station, Alameda, Calif.; Robert L. Armstrong, E. Middlesex Co. M.C.P., City Hall, Cambridge, Mass.; Russell W. Gies, Principal Sanitary Engineer, Commonwealth of Pennsylvania, Media, Pa.; John D. DeCoursey, Cdr., MSC, USN, Naval Med. Field Research Lab., Marine Barracks, Camp Lejeune, N. C.; Maurice W. Provost, Fla. State Bd. of Health, P. O. Box 1871, Orlando, Fla.; Kent S. Littig, 439 Ansley St., Decatur, Ga.; Earl D. Potter, Burlington Co. M.F.C., County Office Building, Mt. Holley, N. J.

Standing Committee on Public Relations: Kenneth D. Quarterman, Chairman, USPHS, Box 129, Savannah Beach, Ga.; John W. Scott, Vermont State Dept. of Agri., Montpelier, Vt.; Norman S. Beaton, P. O. Box 106, Warwick, Va.; John J. Callahan, Des Plaines, Mosq. Ab. Dist., 8130 Ogden Ave., Lyons, Ill.; William Cox Galveston City Health Dept., Galveston, Tex.; Mrs. Ernestine B. Thurman, PHIS, Room 202D, U. S. National Museum, Washington 25, D. C.; Robert H. Peters, No. San Joaquin M.A.D., 404 W. Pine St., Lodi, Calif.

Special Committee on Research and Development: A. S. West, Chairman, Queens University, Kingston, Ontario, Canada; Dale W. Jenkins, Army Chemical Center, Edgewood, Md.; William C. McDuffie, Bur. Entom. & Plant Quarantine, U. S. Dept. of Agri., Box 3391, Orlando, Fla.; Austin W. Morrill, San. Eng. Br. ERBL, Ft. Belvoir, Va.; Harry D. Pratt, USPHS, Com. Disease Center, 50 Seventh St., Atlanta 5, Ga.; Edgar A. Smith, Santa Clara Co. Health Dept., 2220 Moorpark Ave., San Jose 28, Calif.

Program Committee: Richard F. Peters, Chairman, c/o California State Dept. of Public Health, 2180 Milvia St., Berkeley 4, Calif.

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NEWS AND NOTES

THE ALAMEDA COUNTY MOSQUITO ABATEMENT DISTRICT reports that no larvae of the formerly important salt marsh mosquito, *Aedes squamiger*, had been found in the East Bay marshes, and it is felt that this species reduction can be directly attributed to the steadily maintained control program of the past 24 years. The main attack is now being directed at *Aedes dorsalis*, which has also begun to show a marked reduction, accompanied in some cases by a substitution of species by *Culiseta inornata*, which does not aggressively attack man and has a relatively short flight range.

JOHN A. ROWE, of the U. S. Public Health Service, Water Projects Unit, writes to give notice that his station has been transferred to Logan, Utah. He adds: "It seems to me that relatively few AMCA members are familiar with the work going on at this station and the mosquito data . . . being obtained. I'm sure that much of this information would be of interest to many mosquito control organizations and professional workers. Research papers will be written on the basis of these reports but, as you know, it will be some time before these come out. . . ."

"We have tried to provide distribution of reports to those agencies who know the least about our problem. We usually reproduce from 300 to 500 copies of each report and make prompt distribution to the Agricultural Experiment Stations and State Health Departments in the 17 Western States, to the Bureau of Reclamation and SCS Offices and to about 32 libraries in the country. In addition we have about 30 professional workers on our mailing list. Sometimes we have a few copies (100 or so) which are in reserve which might be sent to mosquito-control organizations or to individual workers.

"As you probably know, the primary purposes of our station include:

- (1) Research on the bionomics of encephalitis vectors and principal noxious species associated with Western water resources development, especially irrigation.

- (2) Research on the factors responsible for mosquito problems on new and existing irrigation developments.

- (3) Research on ways and means of controlling these factors on new projects and existing irrigated areas.

"The information obtained by this station is for the edification of all who are interested and engaged in the control of these problems." The station's new address is P.O. Box 334, Logan, Utah.

GEORGE BURTON writes that in his malaria control work in Liberia for F.O.A., they have sprayed about 4,000 dwellings and hoped to have finished by the end of March. The houses ranged in size from single room mud huts to mansions, many of them having more than 25 rooms, and the

average being about 8. WHO teams in the Central Province have found DDT to remain effective on celotex and mud walls for as long as 6 months, but the F.O.A. teams in Monrovia and the Coast have found it to last only about 1 month. Dieldrin is holding up well. Observations have showed that adults rest for 35 to 55 minutes on dieldrin-sprayed surfaces, then make a number of quicker changes of position, followed by knock-down and death in about 3 hours. In order to avoid developing dieldrin resistance more rapidly than necessary, larviciding is still being confined to DDT, and there is definite evidence that constant larviciding has resulted in a relatively low parasite rate (about 20 per cent) in children up to 9 years.

THE DADE COUNTY ANTI-MOSQUITO DISTRICT, in its nineteenth annual report, for 1953, records that the use of shallow ditches in salt marsh drainage work, which was intended to prevent undue salting of the adjacent lands, has proved to be a correct procedure inasmuch as land which had previously been given up as too salty has recently been placed in production. The report adds, resignedly, that the recipients of these benefits have now turned around and plowed over the ditches, obliterating them and creating a new problem. It is also reported that while resistance to DDT has been observed in flies, none has been found in mosquitoes so far.

"ACCORDING TO ONE OF OUR ALASKAN CUSTOMERS," writes the Ward's Natural Science Establishment, in its January Bulletin, sent in by Franklin C. Wray, "Sourdough Charlie had prospected the Alaskan Wilderness for years with little success. Late last spring he started out hoping to make an early find that would enable him to buy the Geiger counter he longed for. After he had been a week in the bush, he suddenly spied an immense pigeon-blood ruby crystal in the bank of a stream.

"Anticipating a quick profit, he immediately cached his meager supplies and started back to the nearest town with his prize. But he didn't take into consideration the hordes of ravenous mosquitoes that descended on his first night's camp. When he awoke in the morning, he opened his pack to see if the fabulous stone were still there. He could hardly believe his eyes, for all that he had was a piece of pale rose quartz quite thoroughly perforated with holes."

HERMAN L. FELLTON, consulting sanitary engineer, has been elected president and chairman of the Board of Directors of Getz Exterminators, Inc., following his acquisition of controlling ownership of the corporation. The company, organized in 1888 and operating in 15 states, is located at 600 N. Highland Avenue, N.E., Atlanta, Georgia.

THE DEATH OF STUART M. GIBSON is reported in the *Skeeter*, of the Virginia Mosquito Control Association. Mr. Gibson suffered a heart attack on 7 April 1954 and died shortly after arriving at the hospital. Norman S. Beaton writes, "Surely mosquito control has had in him a great exponent of the cause and to him goes a large portion of the credit for the growth of mosquito control on the Peninsula [of Norfolk]. Those of us who were associated with him in mosquito control work will greatly miss Mr. Gibson for the sound advice and guidance which he so willingly gave."

DR. A. W. A. BROWN will be visiting in California during the last week of June and into early July, with headquarters at the Vector Control Station in Fresno. Following a review of the programs of field studies being conducted within a radius of some fifty miles from Fresno, a short tour will be made of other control areas in the state. It is planned to observe field use of a number of items of equipment, including both commercial types and those devised by local control units in Alaska, Merced County and other West Coast districts.

DR. LEWIS WENDELL HACKETT, an honorary member of the American Mosquito Control Association and known to many members, was presented with the Walter Reed Medal for 1953, at the annual meeting of the American Society of Tropical Medicine which was held on the 13th and 14th of November at Louisville, Ky. The medal, which may be given to an individual or an institution for outstanding work in the field of tropical medicine, was awarded to Dr. Hackett by the unanimous choice of the Board and was presented by Brigadier General James S. Simmons. The medal has been awarded annually since 1936.

THE ILLINOIS DEPARTMENT OF PUBLIC HEALTH on April 7 sponsored a Mosquito Control Clinic at the Crab Orchard Sportsman's Association Headquarters near Carbondale, Illinois, under the direction of Mr. J. D. Williams and Mr. R. E. Favreau, state sanitary engineers, and Mr. Arthur E. Kaye, Training Officer USPHS. The morning program included discussions on the identification, habits, and biology of mosquitoes as applied to mosquito abatement by Professor F. Earle Lyman, Department of Zoology, Southern Illinois University; the principles involved in the use of larvicides and adulticides for mosquito control by Professor William R. Horsfall, Department of Entomology, University of Illinois; the devices and methods used for collecting mosquitoes by Sanitary Engineer J. D. Williams. The United States Public Health Service film, "Larviciding With DDT," was shown, and the morning session ended with a question and answer period and a talk on safety precautions by Mr. R. K. Gibson, Sanitary Engineer, Alexander-Pulaski Bi-County Health Department. During the afternoon various

types of equipment were demonstrated including mist sprayers, thermal aerosol dispensers, and larviciding equipment. Methods of testing the distribution of insecticides by the several kinds of equipment were demonstrated for the group. The care and maintenance of equipment also was discussed.

About 50 persons attended the meeting and in addition to personnel from many mosquito abatement districts in Illinois, representatives of state parks and recreational areas and drive-in theaters were present. Pertinent information on mosquito control was distributed and Mr. J. D. Williams pointed out the advantages of membership in the American Mosquito Control Association.

It is hoped that following this initial get-together an annual state meeting will be held each spring and possibly a permanent association of those interested in mosquito abatement in Illinois can be formed so that all will benefit by exchange of ideas and by discussion of problems associated with modern methods of mosquito control.—F. Earle Lyman.

JACK E. DENT, of the Norfolk City Mosquito Control Commission, transmits a report from G. R. McPherrin on an apparent instance of viable eggs being laid by female *Culex pipiens* which had received no nourishment of any kind.

"The larvae were taken from the shallow flooding basement on Granby Street," he writes, "and apparently were *Culex pipiens*. They remained in the original pint bottle until pupation.

"My attention was primarily engaged on other work but I did transfer with pipette 5 or 6 pupae to a jar of tap water with a cloth cover, to mature. The jar was dry and clean but not sterilized. The matured insects were *Culex*, apparently *pipiens*, as I had surmised, some males and some females. They remained undisturbed in the cloth-covered jar containing tap water simply because I neglected to throw them out.

"Some time later it came to my attention that there were first instar larvae in the water contained in the jar. Most of the larvae were dead, since there was no nourishment in the tap water. A few were alive but soon died."

GEORGE F. CRAWFORD and HENRY B. BIELBY, employees of the DesPlains Valley Mosquito Abatement District, Lyone, Illinois, retired on December 31, 1953, after twenty-three years service with the District. They are the first employees to retire under the provisions of the Illinois Municipal Retirement Fund. They were the District's oldest employees, both in age and in years of service, serving most of the time as foremen of the spraying and ditching crews. They were efficient, conscientious workmen and had a complete knowledge of the District, writes Franklin C. Wray, Technical Director of the District.

HARRY H. STAGE has recently accompanied a group of malaria control specialists from Indo-

China on a trip to Japan. While he was there, he visited some of the famous views of Japan, including Nikko, the temple city, Lake Hakone at the foot of Mt. Fuji, and Kyoto, famed cultural center and repository of much of the most famous antiquities of Buddhism in Japan, China, Korea and other Far Eastern lands. At Hakone, Harry viewed the malaria control program, one of the few active ones in Japan, where malaria was largely wiped out up to the time of the Korean war. Harry returns to Saigon about May 27.

BETTINA ROSAY OF THE CALIFORNIA VECTOR CONTROL FIELD STATION at Fresno, California, writes in to give an interesting note on the longevity of *Aedes* eggs:

"A sample of soil (about 1 quart) was collected in November 1950, from the Coachella Valley of California. The sample was stored in

a tightly-closed gallon jar. By use of a mechanically-rotated microscope stage (Husbands, *Mosquito News* 12:145-150, 1952) three *Aedes* eggs were recovered in May of 1954. Flooding would not cause the quiescent eggs to hatch, but dechoriation (Mortenson, *Mosquito News* 10:211-212, 1950) revealed fully developed, live embryos within the shells."

THE ARKANSAS - WHITE - RED BASINS INTER-AGENCY COMMITTEE wishes to express its appreciation to Mr. Travis E. McNeel, Chairman of Work Group on Mosquito Control and Allied Problems, for past contributions in laying the groundwork for completion of these tasks. Mr. McNeel leaves this assignment to accept one in the Republic of the Philippines where he will be Chief, Malaria Control Operations for that country, and with him go our congratulations and best wishes in that work.

AMCA FALL MEETING AT TOLEDO, OHIO

The American Mosquito Control Association announces a fall meeting to be held in Toledo, Ohio on September 29, 30 and October 1, 1954. Mr. Otto McFeeley, Director of the North-Central Region, is acting as General Chairman and the Toledo Area Sanitary District will be hosts. The Commodore Perry Hotel in Toledo will be headquarters. Reservations at the hotel should be made early as a large attendance is expected.

The meeting is scheduled to start at 1:00 p.m. on Wednesday and to terminate at noon on Friday. The program will deal entirely with "The Use of Fogs and Mists for Adult Mosquito Control." Every phase of maintenance and of equipment operation and evaluation of results will be discussed. A field trip to the District's shop and offices has been scheduled and demonstrations of the most modern equipment will be made by exhibitors.

REFERENCES TO LITERATURE OF INTEREST TO MOSQUITO CONTROL WORKERS AND MALARIOLOGISTS

HELEN SOLLERS

Plant Pest Control Branch
Agricultural Research Service
United States Department of Agriculture

AEROSOLS

CHAPMAN, H. C., KELLER, J. C., and LABRECQUE, G. C. 1954. Relative effectiveness of several insecticides as sprays and as fogs against salt-marsh mosquito adults. *Mosquito News* 14(1):1-5, 1 ref.

ELLIOTT, R., and FITZ-JOHN, R. A. 1953. Trials of a portable fog generator for mosquito control in West Africa. *Monthly Bul. Ministry Health Gr. Brit.* 12:178-186.

AERIAL APPLICATION

THOMPSON, B. W. 1953. Aircraft applications of insecticides in East Africa. III—Atmospheric turbulence in woodlands. *Bul. Ent. Res.* 44(4): 611-626, 8 refs.

TRIFOMOV, G. K., and SHLIAPOSHNIKOV, M. S. 1953. Testing of hexachlorane dust in dusting of rice field from the airplane. *Med. Parazitol. I Parazit. Bol. (Moskva)* 1:24-25.

ADULTICIDES

BUSTAMANTE, F. M. DE. 1953. Efectos del DDT aplicado dentro de las casas sobre la filariasis. *Prim. Cong. Interamer. de Hig. Mem.* 1952:640-642.

GRAMICICIA, G., GARRETT-JONES, C., and EL DIN SULTAN, G. 1953. Band spraying: An experiment on cheaper residual spraying in malaria control. *Lebanese Med. Jour.* 6(4):245-256.

PACIFICCO, G. 1953. La malaria nel Sannio. *Riv. di Malariol.* 32(1/3):57-60.

PIMENTEL, D., and KLOCK, J. W. 1954. Disinsectization of aircraft by residual deposits of insecticides. *Amer. Jour. Trop. Med. and Hyg.* 3(1):191-194, 4 refs.

SINGH, JASWANT. 1953. Malaria control in areas where the houses are made of mud. *World Health Organ./Mal/86*, 4 pp.

SRIWASTAVA, R. S., CHAND, D., SINGH, M. V. 1954. Malaria control measures in Ganga Khadar colonisation scheme, Hastinapur, District Meerut, Uttar Pradesh (1948-1952). *Natl. Soc. India for Malaria and Other Mosquito-Borne Dis.* Bul. 1 (4):111-119.

LARVICIDES

ISAAC, L. W. 1953. Mosquito toxicology studies in the Kern Mosquito Abatement District. *Calif. Mosquito Control Assoc. Ann. Confr. Proc. and Papers* 21:38-39.

KELLER, J. C., CHAPMAN, H. C., and LA-

BRECQUE, G. C. 1954. Tests with granulated insecticides for the control of salt-marsh mosquito larvae. *Mosquito News* 14(1):5-9, 2 refs.

REINKE, E. A. 1954. Riego con aguas residuales. *Ofic. Sanit. Panamer. Bol.* 36(2):190-192.

VARIOUS TYPES OF CONTROL

ANONYMOUS. 1953. Recent advances in the control of malaria. *Amer. Jour. Pharm.* 125(5): 164-171.

ANTSHOR, S. R. 1953. Possible simplification of complex anti-malaria campaign in villages and regions without new cases of malaria within 2-3 years. *Med. Parazitol. I Parazit. Bol. (Moskva)* 1:93-94.

BERTHOFF, J. H. 1953. Nineteenth annual report Broward County, Florida Anti-Mosquito District, Ft. Lauderdale, 10 pp.

BUENMILLER, E. J. 1953. Report of the Ballona Creek Mosquito Abatement District. *Calif. Mosquito Control Assoc. Ann. Confr. Proc. and Papers* 21:71-72.

CONCHA Y VENEGAS, J. A. 1953. Administración sanitaria de la Sección Antimalarica del programa de control of insectos en la zona del Caribe. *Prim. Cong. Interamer. de Hig. Mem.* 1952:664-672.

ELIGULASHVILI, K. I. 1953. Results of activities of the Sukhums municipal anti-malaria station. *Med. Parazitol. I Parazit. Bol. (Moskva)* 1:92-93.

GILROY, A. B. 1953. Malaria reduction and its relation to control measures. *Natl. Soc. India for Malaria and Other Mosquito-Borne Dis. Bul.* 1 (1):120-126.

GRANT, C. D. 1953. San Francisco Bay Region Report. *Calif. Mosquito Control Assoc. Ann. Confr. Proc. and Papers* 21:70-71.

GRAY, H. F. 1953. Temporary control methods vs. mosquito source reduction. An introduction to a panel discussion "Current trends in mosquito abatement." *Calif. Mosquito Control Assoc. Ann. Confr. Proc. and Papers* 21:46-47.

KIMBALL, J. 1953. Report of the Orange County Mosquito Abatement District. *Calif. Mosquito Control Assoc. Ann. Confr. Proc. and Papers* 21:72.

LOEBER, T. S. 1953. The developing mosquito program in Lake County. *Calif. Mosquito Control Assoc. Ann. Confr. Proc. and Papers* 21: 69-70.

MCARTHUR, J. 1953. Malaria control in Borneo. *Lancet* 265(6787):655-656.

PORTMAN, R. F. 1953. Notes on the control of *Aedes varipalpus*. Calif. Mosquito Control Assoc. Ann. Confr. Proc. and Papers 21:76-77.

SILVA, F. C., DA. 1952. Luta antisezonatica em Canacoma, 1950-1951. Inst. Med. Trop. An. (Lisboa) 9(2):669-684.

TINKHAM, E. R. 1953. Resume of mosquito control in Coachella Valley. Calif. Mosquito Control Assoc. Ann. Confr. Proc. and Papers 21:73.

VALERIO, J. C. 1952. O combate ao paludismo em Vila de Joao Belo. Inst. Med. Trop. An. (Lisboa) 9(2):685-687.

VERENKOV, N. K. 1953. Role of drainage of marshes in the scheme of control of malaria and its efficacy. Med. Parazitol. I Parazit. Bol. (Moskva) 1:54-57.

WARE, S. J. 1953. Coordinated effort and conservation—the permanent way. Calif. Mosquito Control Assoc. Ann. Confr. Proc. and Papers 21:2-4.

WASHBURN, E. 1953. Chemical soaked cloths—a new slap at mosquitoes. Calif. Mosquito Control Assoc. Ann. Confr. Proc. and Papers 21:77.

WILKINS, R. A. 1953. The 1952 flood—mosquito abatement problems in Salt Lake City Mosquito Abatement District, Utah. Calif. Mosquito Control Assoc. Ann. Confr. Proc. and Papers 21:5-6.

INSECTICIDES

LINDQUIST, A. W. 1953. Organic phosphorus insecticides—their advantages, limitations, and hazards in mosquito control work. Calif. Mosquito Control Assoc. Ann. Confr. Proc. and Papers 21:9-11, 1 ref.

REES, D. M., and GRAHAM, J. E. 1953. 1952 field tests of heptachlor for mosquito control. Calif. Mosquito Control Assoc. Ann. Confr. Proc. and Papers 21:6-7, 6 refs.

EQUIPMENT

HALL, L. L. 1953. Selecting the proper hose. Calif. Mosquito Control Assoc. Ann. Confr. Proc. and Papers 21:76.

MULHERN, T. D. 1953. The use of mechanical traps in measuring mosquito populations. Calif. Mosquito Control Assoc. Ann. Confr. Proc. and Papers 21:64-66, 18 refs.

INSECT RESISTANCE

BUSVINE, J. R., and HARRISON, C. M. 1953. Tests for insecticide-resistance in lice, mosquitoes and house-flies. Bul. Ent. Res. 44(4):729-738, 8 refs.

BIOLOGY AND ECOLOGY

ARNOLD, J. R. 1953. A few observations from the project on the embryology of *Aedes nigromaculis* (Ludlow). Calif. Mosquito Control Assoc. Ann. Confr. Proc. and Papers 21:37-38.

BOHART, R. M., MEZGER, E. C., and TELFORD, A. D. 1953. Observations on the seasonal history of *Aedes squamiger*. Calif. Mosquito Control

Assoc. Ann. Confr. Proc. and Papers 21:7-8, 5 refs.

BORG, A. F., and HORSEFALL, W. R. 1953. Eggs of flood water mosquitoes. II. Hatching stimulus. Ent. Soc. Amer. Ann. 46(4):472-478, 18 refs.

BRENNAN, J. M., RUSH, W. A., and HUBERT, A. A. 1954. The present status of *Culex tarsalis* colony at the Rocky Mountain Laboratory. Mosquito News 14(1):26, 1 ref.

BROOKE WORTH, C. 1953. Notes on the anopheline fauna of a hill tract in Mysore State, India. Indian Jour. Malariol. 7(2):125-182, 15 refs.

DE BIAGI, A. M. DE BUEN. 1953. Observaciones ecologicas sobre mosquitos de "El Ajencibre," Puc., Mexico. [Mexico] Inst. de Biol. An. 24(1):177-204.

GERHARDT, R. W., and SHERMAN, E. J. 1953. Preliminary limnological investigations on four California rice fields. Calif. Mosquito Control Assoc. Ann. Confr. Proc. and Papers 21:40-42, 4 refs.

HUSBANDS, R. C., and ROSAY, B. 1953. Irrigated pasture mosquito ecology studies—1952. Calif. Mosquito Control Assoc. Ann. Confr. Proc. and Papers 21:33-37, 5 refs.

JAYEWICKREME, S. H. 1953. Nocturnal mating in *Taeniorhynchus (Mansonioides) uniformis* (Theobald). Nature [London] 171(4352):577.

KITZMILLER, J. B. 1953. Mosquito genetics and cytogenetics. Rev. Brasil. Malariol. 5(4):285-359, many refs.

LOOMIS, E. C. 1953. Population trends of *Culex tarsalis* in the Central Valley of California. Calif. Mosquito Control Assoc. Ann. Confr. Proc. and Papers 21:73-76, 5 refs.

MENDOZA, J. B., and ABINOJA, B. 1952. Observation on supposedly unusual breeding of the Philippine malaria vector. Philippine Jour. Sci. 81(1):53-58.

MORTENSON, E. W. 1953. Observations on the overwintering habits of *Culex tarsalis* Coquillett in nature. Calif. Mosquito Control Assoc. Ann. Confr. Proc. and Papers 21:59-60, 3 refs.

RAMAKRISHNAN, S. P., and PRAHASH, S. 1953. Host predilection of *A. fluviatilis* in Terai Region of Uttar Pradesh, India. Indian Jour. Malariol. 7(2):107-112, 21 refs.

SOROKER, R. H. 1953. Rice field mosquito ecology project progress report—1952. Calif. Mosquito Control Assoc. Ann. Confr. Proc. and Papers 21:39-40.

STAHLER, N., and TERZIAN, L. A. 1953. Studies in the laboratory mating habits of *Anopheles quadrimaculatus* Say. Jour. Expt. Zool. 124(2):317-328.

STONE, C. L. 1953. Late summer production of mosquitoes in relation to rice culture in the Sacramento Valley. Calif. Mosquito Control Assoc. Ann. Confr. Proc. and Papers 21:42-45.

THIEL, P. H., VAN. 1953. Method and significance of the determination of age of female anophelines for basic entomological research in DDT house spraying. Doc. Med. Geog. et Trop. 5(4):289-302, many refs.

VERMEIL, C. 1953. De la reproduction par autogénèse chez *Aedes (O.) detritus* Haliday. Soc. de Path. Exot. Bul. 46(6):971-973, 6 refs.

VUKASOVIC, P., and MARTINOVIC, A. 1953. A contribution to the knowledge of *Anopheles maculipennis* varieties in Sandzak. Inst. Hyg. Bul. 2(1/2):64-71. In Serbian.

WALLIS, R. C. 1954. Notes on the biology of *Culiseta melanura* (Coquillett). Mosquito News 14(1):33-34, 10 refs.

MORPHOLOGY AND PHYSIOLOGY

BALL, G. H., and CLARK, E. W. 1953. Species differences in amino acids of *Culex* mosquitoes. Systematic Zool. 2(3):138-141.

IYENGAR, R. 1953. Un nouveau mode d'alimentation chez la larve d'*Anopheles turkhudi* et les caracteres morphologiques particuliers a cette larve. Acad. des Sci. [Paris] Compt. Rend. 237 (22):1449-1451.

DISTRIBUTION

BONNE-WEPSTER, J., and SWELLENGREBEL, N. H. 1953. The anopheline mosquitoes of the Indo-Australian region. Amsterdam. 504 pp.

FERGUSON, F. F., and MCNEEL, T. E. 1954. The mosquitoes of New Mexico. Mosquito News 14(1):30-31.

FROHNE, W. C. 1954. Mosquito distribution in Alaska with especial reference to a new type of life cycle. Mosquito News 14(1):10-13, 6 refs.

HOLSTEIN, M. 1953. Etudes sur l'anophelisme en A. O. F.—2. Presence d'*Anopheles wellcomei* Theo. 1904. Ann. de Parasitol. Humaine et Compar. 28(4):328-330.

JUDD, W. W. 1954. Results of a survey of mosquitoes conducted at London, Ontario in 1952 with observations on the biology of the species collected. Canad. Ent. 36(3):101-108, 10 refs.

KNIGHT, K. L., and HULL, W. B. 1953. The *Aedes* mosquitoes of the Philippine Islands. 3. Subgenera *Aedimorphus*, *Bankinella*, *Aedes*, and *Cancaerades* (Diptera, Culicidae). Pacific Sci. 7(4):453-481.

KUYP, VAN DER. 1953. Mosquitoes of Curacao. Caribbean Med. Jour. 15(1/2):37-39.

MARTINEZ PALACIOS, A. 1952. *Culex infictus* Theobald y *Culex thriambus* Dyar, mosquitoes nuevos para Mexico (Diptera: Culicidae). Soc. Mex. de Hist. Nat. Rev. 13(1/4):89-95, 6 refs.

———. 1952. Nota sobre la distribucion de los mosquitos *Culex* en Mexico (Diptera: Culicidae). Soc. Mex. de Hist. Nat. Rev. 13(1/4):75-87.

———, and VARGAS, L. 1952. Confirmation de la presencia de *Anopheles (Kerteszia) neivai* H. D. and K. 1917, en Mexico. Soc. Mex. de Hist. Nat. Rev. 13(1/4):45-46, 5 refs.

MENZIES, G. C., and EADS, R. B. 1954. Corrected distribution records of *Culex stigmatosoma* in Texas. Mosquito News 14(1):31-32, 1 ref.

MURPHY, D. R. 1953. Collection records of some Arizona mosquitoes (Diptera: Culicidae). Ent. News 64(9):233-238.

REMENNIKOVA, V. M. 1953. Species of *Anopheles* and varieties of *Anopheles maculipennis* in various typographical zones of southern shores of Azerbaidzhan. Med. Parazitol. I Parazit. Bol. (Moskva) 1:110-118.

SUDIA, W. D., and GOGEL, R. H. 1953. The occurrence of *Orthopodomyia alba* Baker in Georgia. Brooklyn Ent. Soc. Bul. 48(5):129-131.

VARGAS, L., and MARTINEZ PALACIOS, A. 1953. Nota sobre la distribucion de *Haemagogus* en Mexico. Inst. Salubridad y Enferm. Trop. Rev. 13(1):37-39.

VENARD, C. E., and MEAD, F. W. 1953. An annotated list of Ohio mosquitoes. Ohio Jour. Sci. 53(6):327-331.

TAXONOMY

BARR, A. R. 1954. A note on the chaetotaxy of *Aedes vexans* (Meigen, 1830). Mosquito News 14(1):24-25, 5 refs.

BELKIN, J. N. 1954. Remarks on the larval chaetotaxy of the subgenus *Melanoconion* (Diptera: Culicidae). Ent. News 65(2):29-32, 8 refs.

FOOTE, R. H. 1954. Pictorial keys to the mosquitoes of medical importance. V. French Indo-China. Mosquito News 14(1):17-20.

———. 1954. Some observations on stability and uniformity in the nomenclature of larval hairs. (Diptera: Culicidae). Ent. News 65(2):32-35, 3 refs.

GRATZ, N. G. 1954. A gynandromorph of *Culex pipiens molestus* (Forsk.). Mosquito News 14(1):22-23, 6 refs.

KITZMILLER, J. B. 1953. Etude de souches de laboratoire de *Culex pipiens* et *Culex fatigans*. Ann. de Parasitol. Humaine et Compar. 28(4):321-325.

KNIGHT, K. L. 1953. Two new species of mosquitoes from the Yemen (Diptera: Culicidae). Wash. Acad. Sci. Jour. 43(10):320-325.

LIMA, M. M. 1952. Do diagnostico diferencial entre o *Anopheles (Kerteszia) cruzii* e o *Anopheles (Kerteszia) homunculus* na fase larvaria. Rev. Brasil. Malariol. 4(4):401-411.

MATTINGLY, P. F., and LIPS, M. 1953. Notes on the culicini of the Katanga (Diptera, Culicidae). Rev. de Zool. et de Bot. Africaines 47(3/4):311-343.

POLIKARPOVA, L. I. 1953. Subspecies *Anopheles maculipennis* Meig. in Latvia. Med. Parazitol. I Parazit. Bol. (Moskva) 1:19.

VOCKEROTH, J. R. 1954. Notes on northern species of *Aedes*, with descriptions of two new species. (Diptera, Culicidae). Canad. Ent. 86(3):109-116, 5 refs.

TECHNIQUE

BURTON, G. J. 1954. Suggested improvements for an unbreakable aspirator and killing tube. Mosquito News 14(1):27-30.

DRAPER, C. C., and DAVIDSON, G. 1953. A new method of estimating the survival rate of anopheline mosquitoes in nature. Nature [London] 172(4376):503.

FAY, R. W., KILPATRICK, J. W., CROWELL, R. L., and QUARTERMAN, K. D. 1953. A method for field detection of adult-mosquito resistance to DDT residues. World Health Organ. Bul. 9(3): 345-351.

MICKS, D. W., and BENEDICT, A. A. 1953. Infrared spectrophotometry as a means for identification of mosquitoes. Soc. Expt. Biol. and Med. Proc. 84(1):12-14.

QUACKENBUSH, A. 1953. Raising mosquitoes indoors. Frontiers of Plant Sci. 6(1):3.

WOLFINSOHN, M., and GALUN, R. 1953. A method for determining the flight range of *Aedes aegypti* (Linn.). Israel Res. Council Bul. 2(4):433-436.

DISEASES

BERNKOPF, H., LEVINE, S., and NERSON, R. 1953. Isolation of West Nile virus in Israel. Jour. Infect. Dis. 93(3):207-218.

DAVIES, A. M., and HOSHE-PURER, Y. 1953. *Aedes aegypti* as a vector of West Nile virus. Israel Res. Council Bul. 3(1/2):127-128.

DICK, G. W. 1953. Epidemiological notes on some viruses isolated in Uganda; yellow fever, rift valley fever, Bwamba fever, West Nile, Mengo, Semliki forest, Bunyamwera, ntaya, Uganda S and Zika viruses. Roy. Soc. Trop. Med. and Hyg. Trans. 47(1):13-48.

FURMAN, D. P. 1953. The economic significance of mosquitoes to agriculture in California. Calif. Mosquito Control Assoc. Ann. Confr. Proc. and Papers 21:18-20.

GOLDBLUM, N., STERK, V. V., and PADERSKI, B. 1954. West Nile fever. The clinical features of the disease and the isolation of West Nile virus from the blood of nine human cases. Amer. Jour. Hyg. 59(1):89-103, 15 refs.

HAMILTON, P. K., and TAYLOR, R. M. 1954. Report of clinical case of West Nile virus infection probably acquired in the laboratory. Amer. Jour. Trop. Med. and Hyg. 3(1):51-53, 4 refs.

JACOTOT, H., VALLEE, A., and VIRAT, B. 1954. Sur un cas de myxomatose chez le lièvre. Inst. Pasteur Ann. 86(1):105-107, 2 refs.

ENCEPHALITIS

ANDERSON, S. G. 1953. Murray Valley encephalitis: a survey of avian sera, 1951-1952. Med. Jour. Austral. 1:17.

GRUNDMANN, A. W., and LEYMASTER, G. R. 1954. Equine encephalomyelitis in Utah. A survey of horses and man utilizing serum-neutralization tests. Amer. Vet. Med. Assoc. Jour. 124 (922):40-42, 5 refs.

HANSON, R. P., SCOTT, G. R., FERRIS, D., and UPTON, E. 1954. Eastern equine encephalomyelitis in Wisconsin. Amer. Jour. Trop. Med. and Hyg. 3(1):54-56, 8 refs.

KLOPSTOCK, A. 1953. The etiology and epidemiology of encephalitis. (English Abstract). Harefuah (Tel-Aviv) 44(2):35-36.

MCLEAN, D. M. 1953. Transmission of Murray

Valley encephalitis virus by mosquitoes. Austral. Jour. Expt. Biol. Med. Sci. 31(5):491-503.

PELLISSIER, A. 1954. Isolement d'un virus encéphalomyélique a Brazzaville. Inst. Pasteur Ann. 86(1):53-68, 86 refs.

POND, W. L., and COWORKERS. 1954. Japanese encephalitis in Malaya. II. Distribution of neutralizing antibodies in man and animals. Amer. Jour. Hyg. 59(1):17-25, 22 refs.

REEVES, W. C. 1953. The knowns and the unknowns in the natural history of encephalitis. Calif. Mosquito Control Assoc. Ann. Confr. Proc. and Papers 21:53-59.

—, and FRENCH, E. L., MARKS, E. N., and KENT, N. E. 1954. Murray Valley encephalitis: a survey of suspected mosquito vectors. Amer. Jour. Trop. Med. and Hyg. 3(1):147-159, 22 refs.

ROSENBERG, M. Z., SCANLON, J. E., CEDENO, R., and BUESCHER, E. L. 1953. Experimental transmission of Japanese B encephalitis virus from bird to bird by mosquitoes (preliminary report). Med. Bul. U. S. Army Far East 1(7):113-115.

FILARIASIS

BERTRAM, D. S. 1953. A nesting method used for prolonged exposure of cotton rats to superinfection with their filarial parasite, *Litomosoides carinii* (Travassos, 1919). Ann. Trop. Med. and Parasitol. 47(4):371-374, 11 refs.

BRUYNING, G. F. A. 1953. Some data on the filaria vector *Culex quinquefasciatus* Say in Paramaribo. Doc. Med. Geog. et Trop. 5(4):333-338, 4 refs.

KARTMAN, L. 1953. A correlation of malpighian tubule size with development of *Dirofilaria immitis* in the mosquito. Jour. Parasitol. 39(6):671-672.

WINCKEL, W. E., FROS, J., and WIJNGAARDE, E. 1953. *Wuchereria bancrofti* in the upper eyelid. Doc. Med. Geog. et Trop. 5(4):343-346, many refs.

MALARIA

ANONYMOUS. 1953. Important research problems in the fifty-five year plan dedicated to the organization of malaria. Med. Parazitol. I Parazit. Bol. (Moskva) 1:3-9.

— 1953. Datos breves acerca de la lucha antimalarica. Prim. Cong. Interamer. de Hig. Mem. 1952:645-648, 4 refs.

ALLISON, A. C. 1954. Protection afforded by sickle-cell trait against subtertian malarial infection. Brit. Med. Jour. 4857:290-294, 33 refs.

BOQUIEN, Y., HERVOUET, D., and LHERMITTE, —. 1953. Sur deux formes anormales de paludisme de primo-invasion. Acad. Natl. de Med. Bul. 137(25/27):422-425.

BRADLEY, G. H. 1953. The status of malaria in the United States, 1952. Prim. Cong. Interamer. de Hig. Mem. 1952:322-327.

BRITISH MEDICAL JOURNAL. 1954. Malaria in Africa. Brit. Med. Jour. 4855:201-202, 10 refs.

— 1954. Sickling and malaria. Brit. Med. Jour. 4857:320-321.

BRUCE-CHWATT, L. J. 1954. Problems of malaria control in tropical Africa. *Brit. Med. Jour.* 485:169-174, 24 refs.

CAPPONI, M. 1953. Note sur le paludisme a Douala. *Med. Trop. (Marseille)* 13(3):361-364.

CHERNIN, E. 1954. Problems in tropical public health among workers at a jute mill near Calcutta. I. Malaria in the labor population. *Amer. Jour. Trop. Med. and Hyg.* 3(1):74-93, 4 refs.

COVELL, G. 1953. Current research toward a global control of malaria. *New England Jour. Med.* 249(4):125-131.

EXPERT COMMITTEE ON MALARIA. 1953. Fifth Report. *World Health Organ./Mal* 101, 59 pp.

FARTOVSKAJA, E. I. 1953. Rol'srednego meditsinskogo rabotnika v bor'be s malariiei na Glavnom Turkmenskome Kanale. *Feldsher I Akusherka* 4:5-8.

GABALDON, A. 1953. Importancia de la mortalidad sin diagnostico medico en los datos bioestadisticos referentes a la malaria en Venezuela. *Ofic. Sanit. Panamer. Bol.* 35(1):1-10.

GOVERNMENT OF INDIA. Ministry of Health. 1953. Summary proceedings of the first meeting of the Central Council of Health held at Hyderabad on the 29th, 30th and 31st January 1953, 73 pp. New Delhi.

HENRY, A. F. X. 1953. Kala-azar et paludoflucation. *Rev. du Paludisme et med. Trop.* 11(103):7-9.

HULSHOFF, A. A. 1953. Nieuwe inzichten over malaria. *Nederland Tijd. v. Geneesk.* 97(2):120-123.

MOISE, R. 1953. L'incidenza dell'infezione da "*Plasmodium malariae*" nell'endemia malarica della Somalia. *Riv. di Malariol.* 32(1/3):11-39.

PLOYE, M. 1953. Le paludisme a travers le monde; Mexique. *Rev. du Paludisme et Med. Trop.* 11(107):97-103.

POLUMORDINOV, A. K. 1953. Characteristics of certain types of potential foci of malaria in the zone of water reservoirs. *Gigiena I Sanitariia (Moskva)* 8:19-25.

PRATT, H. D. 1953. Programme de controle antimalarique de l'E. C. A. en Indochine. *Rev. du Paludisme et Med. Trop.* 11(104):36-39.

SALES, J. B. DE. 1953. Geografia medica do estado do Ceara: distribuicao geographica da malaria. *Rev. Brasil. de Med.* 9(8):564-565.

URENA HERNANDEZ, L., and GANAN, D. 1953. Paludismo en la Republica Dominicana. *Prim. Cong. Interamer. de Hig. Mem.* 1952:649-663, 7 refs.

WILCOCKS, C. 1953. Summary of recent abstracts. III. Malaria. *Trop. Dis. Bul.* 50(4):263-273.

Malaria—Clinical Aspects

CORCORAN, T. E., HEGSTROM, G. J., ZOECKLER, S. J., and KEIL, P. G. 1953. Liver structure in nonfatal malaria. *Gastroenterology* 24(1):51-62.

CORCOS, A. 1953. Deux cas de paludisme de primo-invasion a symptomatologie urticarienne. *Soc. de Path. Exot. Bul.* 46(6):945-947.

WRIGHT, H. B. 1954. Malaria in ex-service-men. *Brit. Med. Jour.* 485:98-99.

Malaria—Epidemiology

DELGADO DELGADO, E. 1953. Paludismo; algunos aspectos de la epidemiologia y profilaxis de esta enfermedad. *Clin. y Lab.* 55(323):81-95.

MNATSAKANIAN, S. S., and MANUCHARIAN, R. A. 1953. Epidemiological significance of first summer generation of *Anopheles maculipennis*. *Med. Parazitol. I Parazit. Bol. (Moskva)* 1:25-29.

Malaria—Eradication Projects

DOWLING, M. A. C. 1953. Control of malaria in Mauritius; eradication of *Anopheles funestus* and *Aedes aegypti*. *Roy. Soc. Trop. Med. and Hyg. Trans.* 47(3):177-198.

GALLARDO, M. C. 1954. Plan para la eradicacion del paludismo en Panama. *Ofic. San. Panamer. Bol.* 36(1):53-59, 3 refs.

Malaria—Plasmodia

BELTRAN, E., and AMANDA, REYES, L. 1953. Infeccion con *Plasmodium berghei* en el raton blanco por via oral. *Rev. Inst. Salubridad y Enferm. Trop. Mexico* 13(1):13-15.

BOX, E. D., GINGRICH, W. D., and CELAYA, B. L. 1954. Standardization of a curative test with *Plasmodium berghei* in white mice. *Jour. Infect. Dis.* 94(1):78-83.

BRAY, R. S. 1954. The tissue phase of malaria parasites. *Jour. Trop. Med. and Hyg.* 57(2):41-45, 9 refs.

DAVID, A., and KRISHNAN, K. W. 1953. Some observations on experimental infections in domestic pigeons (*Columba livia Gmelin*) with *P. relictum*. *Indian Jour. Malariol.* 7(2):113-115, 5 refs.

DEMINA, N. A. 1953. Relation of nyctohemeral rhythm of birds to mass cycle of *Plasmodium relictum*. *Med. Parazitol. I Parazit. Bol. (Moskva)* 1:41-48.

DE SANCTIS-MONALDI, T., and RAFFAELE, G. 1953. Sulla fase negative del sangue nell'infezione da *Plasmodium vivax*. *Riv. di Malariol.* 32(1/3):1-10.

GARNHAM, P. C. C., and COWORKERS. 1954. Pre-erythrocytic stages of human malaria: *Plasmodium ovale*. A preliminary note. *Brit. Med. Jour.* 4856:257, 4 refs.

HAWKING, F., and MELLANBY, H. 1953. Transmission of *Plasmodium knowlesi* through *Anopheles stephensi*. *Roy. Soc. Trop. Med. and Hyg. Trans.* 47(5):438-439.

HENRY, X. 1953. La premunition et les flechissements de la resistance a l'hematozair. *Rev. Paludisme et Med. Trop.* 11(107):103-108.

KARTMAN, L. 1953. Comparative susceptibility of *Anopheles quadrimaculatus* "strains" to domestic *Plasmodium vivax*. *Jour. Parasitol.* 39(6):668-669.

LAIRD, M. 1953. *Plasmodium vaughani* Novy and MacNeal, 1904, in the New Hebrides: with a note on the occurrence of *elongatum*-type

exoerythrocytic schizogony in this species. Jour. Parasitol. 39(4):357-364, 15 refs.

MANRESA, M. JR. 1953. The occurrence of phanerozoites of *Plasmodium lophurae* in blood-inoculated turkeys. Jour. Parasitol. 39(4):452-455.

MUIRHEAD-THOMSON, R. C. 1954. Low gametocyte thresholds of infestation of *Anopheles* with *Plasmodium falciparum*. A significant factor in malaria epidemiology. Brit. Med. Jour. 4853:68-70, 12 refs.

PEREZ-REYES, R. 1953. *Anopheles aztecus* (Hoffman, 1935) a new definitive host for the cyclical transmission of *Plasmodium berghei* Vincke and Lips, 1948. Jour. Parasitol. 39(6):603-604, 5 refs.

RAMAKRISHNAN, S. P., PRAKASH, S., and KRISHNASWAMI, A. K. 1953. Studies on *Plasmodium berghei* n. sp. Vincke and Lips, 1948. XI. Haematology of blood-induced infections in albino rats. XII. Attempts to estimate in vivo the acquired immunity in albino rats. Indian Jour. Malariol. 7(2):93-106, refs.

RAY, A. P., and BHATTNAGAR, V. N. Avian *Plasmodium* in Indian birds. Part I. Indian Jour. Malariol. 7(2):121-124, 7 refs.

—, and MENON, M. K. 1953. A *Plasmodium* in common Indian partridges. Nature [London] 172(4380):687.

SHAKHNOVICH, S. I. 1953. Invasion of erythrocytes by *Plasmodium* in various clinical forms of tropic malaria. Med. Parazitol. I Parazit. Bol. (Moskva) 1:48-53.

SHERWOOD JONES, E., MAEGRAITH, B. G., and GIBSON, Q. H. 1953. Pathological processes in disease. IV. Oxidations in the rat reticulocyte, a host cell of *Plasmodium berghei*. Ann. Trop. Med. and Parasitol. 47(4):431-437, many refs.

SINGH, JASWANT, RAY, A. P., and NAIR, C. P. 1953. Isolation of a new strain of *Plasmodium berghei*. Nature [London] 172(4368):122.

THURSTON, J. P. 1953. *Plasmodium berghei*. Expt. Parasitol. 2(3):311-332, many refs.

WHITFIELD, P. R. 1953. Studies on the nucleic acids of the malaria parasite, *Plasmodium berghei* (Vincke & Lips). Austral. Jour. Biol. Sci. 6(2):234-243, 22 refs.

Malaria—Therapeutics and Antimalarials

BAMI, H. L. 1953. Recent advances in synthetic antimalarials 1948-1952. Indian Jour. Malariol. 7(2):183-219, many refs.

BENEDETTI, L. 1953. Profilaxis del paludismo. Rev. Med. de Cordoba 41(5):161-163.

BRITISH MEDICAL JOURNAL. 1953. Antimalarial drugs. Brit. Med. Jour. 4830:266-267.

— 1954. Milk and malaria. Brit. Med. Jour. 4859:447-448.

BUSTAMANTE, F. M. DE. 1953. El camoquin en el tratamiento supresivo de la malaria. Prim. Cong. Interamer. de Hig. Mem. 1952:643-644.

CHAMORRO, J. 1953. Sobre el tratamiento del paludismo por la autohemoterapia. Rev. Clin. Espanola 49(2):121-123.

COATNEY, G. R. 1953. Estado actual de la primaquina y pyrimethamina. Prim. Cong. Interamer. de Hig. Mem. 1952:638-639.

COVELL, G., SHUTE, P. G., and MARYON, M. 1953. Pyrimethamine, daraprim, the treatment of vivax malaria. Brit. Med. Jour. 4830:258-259.

FAIRLEY, N. H., and ADAMS, J. C. L. 1954. Malaria prophylaxis. Brit. Med. Jour. 4856:274.

FIELD, J. W., STRAHAN, J. H., EDESON, J. F. B., and WILSON, T. 1952. Studies on the chemotherapy of malaria. I. The suppression of malaria by synthetic drugs. Med. Jour. Malaya 7(2):67-89.

GREENBERG, J. 1953. Reversal of the activity of chlorguanide against *Plasmodium gallinaceum* by free or conjugated p-aminobenzoic acid. Expt. Parasitol. 2(3):271-279, 14 refs.

GUILLAUME, A., and MYER, R. 1953. Le plan d'assainissement du reid Alsacien est en voie de réalisation. Rev. du Paludisme et Med. Trop. 11(107):109-110.

GUNTHER, C. E. 1953. Sidelights on chloroquine: two cases of interest. Med. Jour. Austral. 1(17):594.

HAWKING, F. 1954. Milk, p-aminobenzoate, and malaria of rats and monkeys. Brit. Med. Jour. 4859:425-429, 18 refs.

JOSEPHSON, E. S., TAYLOR, D. J., GREENBERG, J., and COATNEY, G. R. 1953. Further studies on the effect of antimalarial drugs against erythrocytic forms of *Plasmodium gallinaceum* in vitro. Jour. Infect. Dis. 93(3):257-262, many refs.

KONTOROVSKAI, T. M. 1953. Exoerythrocytic infection in chicks infected with blood containing *Plasmodium gallinaceum* and treated with acricrine. Med. Parazitol. I. Parazit. Bol. (Moskva) 1:53-54.

MACKERRAS, M. J. 1953. Suppression of *Plasmodium berghei* in rats on a milk diet. Austral. Jour. Sci. 16(1):24-27.

MOHR, W. 1953. Parentele resochin-terapie bei den verschiedenen malariaformen. Ztschr. f. Tropenmed. u. Parasit. 4(2):137-153.

MUDROW-REICHENOW, L. 1953. Die gametozide wirkung des primaquine im tierversuch verglichen mit plasmochin. Ztschr. f. Tropenmed. u. Parasit. 4(2):161-165.

PHILLIPS, M. G. 1954. Malaria prophylaxis. Brit. Med. Jour. 4854:155.

PLOYE, M. 1953. Une étrange pretention de priorite; la quinine, decouverte Allemande. Rev. du Paludisme et Med. Trop. 11(103):10.

ROTTEGLIA, E. 1953. Chemioterapia del paludismo ed i nuovi antimalarici daraprim e primaquina. Minerva Farmaceutica 2(4):140-141.

SCHNEIDER, J. 1953. Cortisone et paludisme action nulle dans des essais sur *Pl. berghei*, *Pl. gallinaceum* et *Pl. vivax*. Soc. de Path. Exot. Bul. 46(6):1016-1023, 8 refs.

—, and MONTEZIN, G. 1953. *Pl. berghei* et lait absence d'action du regime lacte chez la souris. Soc. de Path. Exot. Bul. 46(6):947-952, 4 refs.

SERGE, M. 1953. La prophylaxie du paludisme a Tananarive en 1951, incidences epidemio-

logiques et demographiques. Rev. du Paludisme et Med. Trop. 11(104):26-36.

SINGH, JASWANT, RAY, A. P., and CHANDRASEKHAR, G. R. 1953. Screening of antimalarials against *P. gallinaceum* in chicks. Indian Jour. Malariol. 7(2):117-119, 6 refs.

TAYLOR, R. Y. 1953. Experiences with pyrimethamine in Kenya. Brit. Med. Jour. 4830: 285.

WINCKEL, C. W. F. 1953. Proprieties gametocides des antimalariques. Rev. du Paludisme et Med. Trop. 11(103):1-6.

YELLOW FEVER

BEVIER, G., TORRES-MUNOZ, N., and DORIA MEDINA, J. 1953. La epidemiologia de la fiebre amarilla en Bolivia (1949-1952). Prim. Cong. Interamer. de Hig. Mem. 1952:279-285.

CALVO, A. E., and GALINDO, V. P. 1953. Epidemiologia de la fiebre amarilla en Panama (1949-1952). Prim. Cong. Interamer. de Hig. Mem. 1952:259-271, 6 refs.

CANNON, D. A., and DEWHURST, F. 1953. Vaccination by scarification with 17D yellow fever vaccine prepared at Yaba, Lagos, Nigeria. Ann. Trop. Med. and Parasitol. 47(4):381-393, 7 refs.

CASTILLO, G. 1953. La fiebre amarilla en Nicaragua. Prim. Cong. Interamer. de Hig. Mem. 1952:272-277.

COURTNEY, K. O. 1953. Vacunacion contra la fiebre amarilla. (Experiencia en Panama.). Prim. Cong. Interamer. de Hig. Mem. 1952:328-330.

DE SOUZA MANSO, C. 1953. Consideraciones generales sobre la vacunacion antiamarilla en el campo, efectuada en Brasil de 1937 a 1952. Prim. Cong. Interamer. de Hig. Mem. 1952:322-327.

DICK, G. W. 1953. Yellow fever; a problem in epidemiology. Brit. Med. Bul. 9(3):215-220.

GILLET, J. D., and ROSS, R. W. 1953. The laboratory transmission of yellow fever by the mosquito *Aedes (Stegomyia) strelitziae* Muspratt. Ann. Trop. Med. and Parasitol. 47(4):367-370, 9 refs.

GONZALEZ, C. L., and DIAZ, R. I. 1953. Fiebre amarilla en Venezuela. Prim. Cong. Interamer. de Hig. Mem. 1952:248-258, 5 refs.

HUSSON, R. A., and KOEBER, R. 1953. Le vaccin contre la fièvre jaune prepare par l'Institut Pasteur de Dakar. Inst. Pasteur Ann. 85(6):735-745, 17 refs.

MACNAMARA, F. N. 1953. Uganda S and yellow fever viruses; a slight relationship shown by experiments in rhesus monkeys and white mice. Brit. Jour. Expt. Path. 34(4):392-399.

NEGhme, A., ALBI, H., and GUTIERREZ, J. 1953. Campana de erradicacion del *Aedes aegypti* en Chile. Prim. Cong. Interamer. de Hig. Mem. 1952:315-317, 3 refs.

PENNA, H. A. 1953. Técnicas adoptadas en el Laboratorio de Fiebre Amarilla de Rio de Janeiro para la preparacion en gran escala de la vacuna 17D. Prim. Cong. Interamer. de Hig. Mem. 1952:319-321.

PINTO SEVERO, O. 1953. Erradicacion del *Aedes aegypti* en las Americas. Prim. Cong. Interamer. de Hig. Mem. 1952:286-310.

RECIO Y FORNS, A. 1953. La doctrina de Finlay y sus investigaciones a la luz de los conocimientos modernos sobre fiebre amarilla. Prim. Cong. Interamer. de Hig. Mem. 1952:237-245, 12 refs.

RICO-AVELLO, C. R. 1953. Fiebre amarilla en Espana; epidemiologia historica. Rev. Sanid. e Hig. Pub. 27(1/2):29-87.

ROUANET, P. L. 1953. Metodos empleados por el Servicio Nacional de Fiebre Amarilla en su campana de erradicacion del *Aedes aegypti* en el Brasil. Prim. Cong. Interamer. de Hig. Mem. 1952:318.

LITERATURE REFERENCES AND REVIEWS

SOLLERS, H. 1954. References to literature of interest to mosquito control workers and malariologists. Mosquito News 14(1):47-54.

WILCOCKS, C. 1954. Summary of recent abstracts. III. Malaria. Trop. Dis. Bul. 51(3):241-247.

PUBLIC RELATIONS

McELROY, J. J. 1953. Agriculture and mosquito abatement progress. Calif. Mosquito Control Assoc. Ann. Confr. Proc. and Papers 21:12-13.

SUBJECTS NOT COVERED BY OTHER HEADINGS

AUGUSTSON, G. F., and WOOD, S. F. 1953. Notes on California mammal ectoparasites from the Sierra Nevada foothills of Madera County. South. Calif. Acad. Sci. Bul. 52(2):48-56. (Includes mosquitoes).

MOLINA, G. 1953. Organization e integracion de los servicios de salubridad. Prim. Cong. Interamer. de Hig. 1952:99-114, 9 refs.

SAILER, R. I., and LIENK, S. E. 1954. Insect predators of mosquito larvae and pupae in Alaska. Mosquito News 14(1):14-16, 4 refs.

SMITH, G. F. 1953. The use of natural resting stations in the Kern Mosquito Abatement District. Calif. Mosquito Control Assoc. Ann. Confr. Proc. and Papers 21:63-64.

TERZIAN, L. A. 1953. The effect of x-irradiation on the immunity of mosquitoes to malarial infection. Jour. Immunol. 71(4):202-206.

TRAGER, W., and MCGHEE, R. B. 1953. Inhibition of chicken tumor I by plasma from chickens infected with an avian malaria parasite. Soc. Expt. Biol. Proc. 83(2):349.